

AVIATION WEEK

A McGRAW-HILL PUBLICATION

Nov. 17, 1952

50 CENTS

RUBBER "PLANTATION" IN MINNEAPOLIS

When we were developing a tank unit for one of our electronic fuel measurement systems, we needed rubber of especially high quality to use in spacing electrodes.

Upon investigation, we found no such material existed on the market.

So we called on the Honeywell Plastics Division to develop a synthetic rubber that would meet our requirements. They did, and for a time even produced it. That's why we dubbed the lab pictured here our "rubber plantation."

Today we obtain this rubber from an outside supplier — who uses the process and formula developed by the Honeywell Plastics Laboratory.

There have been many other occasions when the Aeronautical Division has received invaluable help from the diversified Honeywell organization — help with problems that seemingly were far removed from the aeronautical field.

We'll be asking for, and getting, this kind of help again and again in the years to come — because it's one of the best ways to make sure you keep on building *automatic controls* of the very highest quality for the aviation industry.

MINNEAPOLIS
Honeywell
Aeronautical Controls



RESEARCH *is the reason*



The new Engineering Research Laboratories at Hydro-Aire are considered the finest and most complete company-operated in their field. This division is equipped and manned to fabricate prototype parts from preliminary design, evaluate their performance under conditions simulating actual operation and to qualify the parts according to customer and military specifications—all without interference to general production.

Yes, Research is an important reason why every fighter, every bomber, every transport is Hydro-Aire equipped.

HYDRO-AIRE
Inc.
BURBANK, CALIFORNIA
Subsidiary of Crane Co.

MANUFACTURERS OF FUEL, HYDRAULIC, PNEUMATIC AND ELECTRO-MECHANICAL AIRCRAFT ACCESSORY EQUIPMENT

B.F. Goodrich



New B. F. Goodrich cell weighs 38% less, carries more fuel

No sooner is one model of the Thunderjet in production than designers once again set their perpetual job: above every possible curve of weight-saving room for more armament, more every possible fuel, more room for fuel—make way for longer flight range.

Republic engineers figured they could carry more fuel if they could save the space in the wings— including odd-shaped corners and curves. But this would add weight, and it looked as though the tricky shapes couldn't be built anyway.

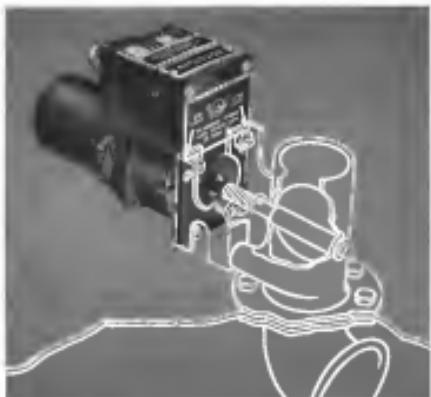
They brought this dual problem to B. F. Goodrich, and engineers tackled the toughest: space-wise. A thinner wall was developed that would still withstand the same pressure. A way was found for building wings that would fit the odd corners, every curve, every jag. And finally, a lighter fabric was worked out that saved 38% more weight.

It all added up to more gallons of fuel and 38% less weight than cells in the early Thunderjets. The new B. F. Goodrich cells have been joined on the famous F-84G, will soon be making duty on the new F-84F and RF-84F.

The development of the lighter-weight fuel cells is another example of B. F. Goodrich's leadership in rubber research and engineering on the problems of aircraft. Other B. F. Goodrich products in aircraft include tires, wheels and landing gear, aircraft rubber, De-Icer, Aircraft Fluorocarbon adhesives, Permaseal Sealing Zippers, inflation units, Rivets, aircraft accessories. The B. F. Goodrich Company, Aerautical Division, Akron, Ohio.

B.F. Goodrich
FIRST IN RUBBER

RAM AIR VALVE ON REPUBLIC'S F-84 *Airborne actuated*



An R-430 type ROTORETTE® Electric Rotary Actuator operates the valve which controls ram air to the cockpit of Republic's F-84.

This Airborne actuator features adjustable positive stops, load sensitive limit switches, radio noise filter, and weight of less than 1.5 pounds.

Perhaps you have a similar application. Our literature in the I.A.S. Aeronautical Engineering Catalog gives complete information on ROTORETTE and other Airborne electromechanical actuators for the aircraft industry.



AVIATION CALENDAR

Nov. 17-18—First regular meeting, Openings Research Society of America, National Bureau of Standards, Washington, D. C.
Nov. 18—National Aviation Trade Assn annual convention, Hollywood Roosevelt Hotel, Los Angeles
Nov. 19-20—Fourth Annual Safety Seminar sponsored by Flight Safety Foundation, Hamilton, Ohio
Nov. 24-25—Joint Industry Conference on Personnel Planning sponsored by General Motors Corp., R. M. Hollingshead Corp. and Westinghouse Hotel, Cincinnati, N. Y.
Nov. 30-Dec. 1—Annual meeting of AMFE, Hotel Statler and McElroy, New York, N. Y.
Dec. 5—Fourth annual Air Corps Assn (ASDA) Hotel Statler, New York, N. Y.
Dec. 2-3—Symposium on flight medical, sensory, language and extremes for aviators, NAE, AMFE, AMF, and MAME, Hotel Statler, New York
Dec. 2-3—Aviation Distributors and Manufacturers Assn tenth annual meeting, The Sheraton, Miami Beach
Dec. 5-6—American Racquet Society, Hotel McElroy, New York, N. Y.
Dec. 5-6—Second Experimental Stress Analysis seminar meeting, Hotel McElroy, New York
Dec. 5-6—Sixth annual American Aviation Conference, Dayton, Ohio
Dec. 11-13—Annual Wright Beech dinner, 7:30 p.m., Statler Hotel, Washington, D. C. Wright Beech dinner to be presented by L. S. p. m., U. S. Chamber of Commerce auditorium
Dec. 13-14—Annual meeting and supporting display of Society of American Engineers, Sheraton-Carlton Hotel, Detroit, Detroit
Jan. 14-16—AIAA-IEE-NASA conference on High Frequency Measurements, Statler Hotel, Washington, D. C.
Jan. 20-25—Space Maintenance Conference, Public Auditorium, Cleveland, Ohio
Jan. 20-25—Annual meeting of the American Institute of Aerodynamics, Engineers Hotel Statler, New York, N. Y.
Mar. 27-28—National Production Forum of the NAE, Hotel Statler, Cleveland, Ohio
Apr. 12-Second annual International Motor Sports Show, Grand Central Palace, New York, N. Y.
Apr. 18-20—Aeronautical Production Forum, National Aerospace Meeting and Aircraft Engineering Display (NAE), Hotel Casino Clinton and Hotel Statler, New York, N. Y.

PICTURE CREDITS

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NEWS DIGEST

Domestic

Fridays work toward the element of the world's first nuclear-powered aircraft will start soon, according to the Atomic Energy Commission's Idaho operations office. Nuclear was given the contract that test flights were to be available about Nov. 15 for construction of an assembly and maintenance area and an administration area for prototype aircraft nuclear ground testing facilities, says Agency 11th. Defense Dept. and specifications will be issued Jan. 15. bids will be opened Jan. 5. Con subcontract Victor has contracted to develop an engine suitable for an atomic powerplant, and General Electric is developing the engine.

Seven Bell helicopter longitudinal autorotational flight from Ft. Worth, Tex., to Niagara Falls, N. Y., has been accepted as an official world record by the Federation Aeronautique Internationale. Certified distance has been set at 1,217.137 mi. Test Pilot Elton J. Stoen made the flight as a Bell 47D-1 on Dec. 12 for 55 min. on Sept. 17.

United Air Lines' strike of 290 flight engineers will end off after a fact finding board had been set up by President Truman. The strike was called to force UA to close the gap between flight engineers and flight captains on BEC and Stewardess flights.

Merion County Airport, Tredyffrin, N. J., has been awarded by commercial aircraft buyer for New York in World War II. It has four 4,000-ft paved runways and a total area of 500 acres. Construction of runway lights will be completed in a few months.

Robert L. Turner has been appointed Acting Administrator of the Defense Air Transportation Administration, the post recently vacated by Gen. W. T. Ireland, vice president of United Airlines.

A Convair-Liner 340, first of an ordered to Hawaiian Airlines for service on the carrier's 400 mi. island system, has been delivered to the carrier.

Helicopter passenger services were expected to be in operation sometime late in 1953 in Los Angeles, New York and possibly Chicago, L. Welch Page, former Chairman of the Calif. Aerospace Board, predicted. Helicopter rental service is now operating in 92 American communities.



BRITISH OVERSEAS AIRWAYS' Coast 1 flight on the present jet 30 H. from the carrier at Rome's Ciampino Airport shortly after it landed on itself Oct. 26. There was no provision or was against landing to report from Rome, the plane had gained only 80 ft altitude when it went down. Although the license had been issued to the pilot, he was captured when he was no

more than 1,000 ft from the landing point. The aircraft was damaged when the landing gear collapsed.

Commercial-owned aircraft were total about 9,100 planes, some 1,700 of them multi-engine. Private companies also own about 10,000 planes, though these are mostly aircraft purchased, according to Planes, Aircraft Industries Assn publication.

Financial

Trans World Airlines plans to raise cash operating capital by selling 585,915 shares of common stock, par \$1, to stockholders at the rate of one seventh of a share for each share held. Elgin Tool Co., which holds 75% of the carrier's common, has agreed to buy enough of the new stock to cover TWA's buying at least 400,000 shares.

Bell Aircraft Corp. reports net income of \$1,603,150 on gross sales and other revenues of \$56,422,410 for the nine months ended Sept. 30. Unfilled orders as of that date amounted to \$477 million.

Gen. E. Martin Co. shows net income of \$1,716,485 for the quarter ended Sept. 30, with a net of \$1,726,784 for the three quarters ending same date. Sales for the first nine months of 1952 amounted to \$101,088,465.

Flying Tiger Line had a gross revenue of \$6,197,530 for the quarter ended Sept. 30.

Sanderson Machine Tool Co. had net earnings of \$1,466,578 after taxes for the nine months ending Sept. 30. Earnings in the three months ended

International

The Dominican Republic has signed the International Civil Aviation Organization's new air law convention obligating liability for damage done by foreign aircraft to third parties on the ground. Seventeen other nations have ratified the agreement.

A group of Trans World Airlines officials has departed for the Far East on a survey flight to study possibility of operating air or route between Bangkok and Tokyo. Planned stops are Tokyo, Colombo, Calcutta, Bangkok, Hong Kong, Kuala Lumpur and Batavia. The flight is being made in a Convair 990. Wavon Lee Person, chairman of the board of TWA, is heading the survey group.



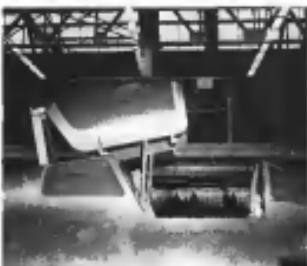
MYSTERE 4 BEATS 657 MPH—During a recent demonstration for Allied officials, this new Donnet-Mystere 4 fighter did 657 mph. It has a Hispano-Suiza 10y with afterburner. U.S. has a production off-shore procurement order for 150 Mystere 4s.

New Aircraft In the News

NEW KAMAN FLD-5 FLIED—A pair of the latest model FLD-5 helicopters (right) is shown at the Kaman plant, Windsor Locks, Conn., showing their new tail overrider. These craft have charter tailfins. Their present BTBIs are increased by 20 percent. The new shroud and vented fuel tank have 53 cu. ft. area, and the entire fuel tank has been increased 2.5 sq. ft. to 125 sq. ft. The blades have been aerodynamically modified.



PRODUCTION F-5F SHOWN—Below is first photo of a production sweptwing Republic F-5F displayed at a recent "open house" at Farmington, L. L. N. Y. Particularly noteworthy is the new cockpit canopy design. Fins and booms are behind wings.



WHO'S WHERE

In the Front Office

WILLIAM W. WOOD, chief engineer for Learjet Aviation Inc., Binghamton, N. Y., has been named vice president engineering by the firm. Wood joined Lear in 1941 as a field engineer.

JOHN F. DODDING has been designated a vice president of California Eastern Airlines. He joined CEA last January and at one time was director of operations for Air Transport, Inc.

E. E. MURKIN has been named director of technical assistance of the International Civil Aviation Arm. His previous post was as external relations officer for ICAD.

Changes

LORNE G. RACKER has been promoted to manager of American Car & Foundry's St. Charles, Ill., plant, where he is responsible for 847 design actions.

ROBERT A. TURKE has been promoted to superintendent of Messier Standard division experimental shop, Windsor Locks, Conn., joining James L. Lamont, E. N. Nafziger, assistant superintendent, experimental, and George W. Egan, materials and methods.

GEORGE PETERSON, JR., has been appointed director of aircraft sales for Cessna Flugs Co., Cessna, Kan.

JOHN M. WILSON has been named vice president of the newly formed aircraft sales department of Westinghouse Electric Corp.'s Aviation Gas Turbine Division, Philadelphia, Pa.

ANTHONY J. KERSEY has been appointed manager, Materials Division, Pacific Aerospace Corp., Torrance, Calif.

G. G. (Gib) BURSTY has joined from Armstrong Co., San Diego, as executive assistant to the director of engineering. At Armstrong he returned to the company to fill the reactivated post of chief of structure and also the post of chief of aerodynamics.

THOMAS B. MORSE has been appointed general sales manager for G. M. Commco Co., Pennsauken, N. J.

LOWELL J. WHALEY has been designated Midwest Airlines director of transportation and city ticket offices, succeeding Robert E. Bremmer.

PROKLES D. WILKINS, formerly managing editor of Flying magazine, has joined Löwen Aircraft, N. Y., public relations firm.

WILLIAM KIEFER, Ben Lee and William Connelly, Chicago, have been appointed an American West's marketing team, which is engaged in a special project of the MacLean-Hill Publishing Co., which will be an unnamed client.

Honors and Elections

BEN GILLEN, San Diego, has been elected chairman of the board of the Navy Research and Technical Association, a non-governmental arm of the Navy. The air force board has been reorganized following the reorganization of the former associations. Markle, Casner, Key, Brink is now vice president.

INDUSTRY OBSERVER

► Don't be surprised if Howard Hughes sells the Hughes Aircraft Co. at Culver City soon and withdraws from the aviation and electronics parts of the firm named after him. Hughes' financial and management resources to determine if this has been the technical, financial and management resources to carry out Hughes' heavy commitments to USAF in aerospace radar, guided missiles and jet fighters. Financial management troubles is one reason for the impending sale.

► Watch for the Glenn L. Martin Co. to get back into the USAF picture with a design for a supersonic jet bomber armed at low level attack work.

► Convair shortly will flight test its F2Y, supersonic under-boost fighter with hydrokinetic retractable wings, developed for aircraft carrier landings as a result of joint research by NASA, Navy, Convair, Eds and All-American Airways.

► Navy's Bureau of Aeronautics doesn't anticipate the current bottleneck in production on the Wright J65 (supplemental) engine will affect its current order for the engine. Order was for relatively small quantities for a new fighter—the North American FJ-3. Present airtframe schedules indicate the engine won't be required for at least another year. If Wright makes good on the initial Navy delivery schedules the J65 may be used in additional Navy fighter types.

► USAF and Navy finally have resolved their arguments over the use of future fighter development with a decision to put each contractor to work developing turboprops in the 15,000 hp. class. Largest current development programs are the PBWA T52, rated at about 5,500 hp., and the Wright T-49, a turboprop variation of the basic Superfort design.

► Aero 105 delta fighter has been named the Vulcan. It is powered by two advanced versions of the Bristol-Boreas Avon and is capable of very high subsonic speeds.

► Avroco Ltd., one of the largest British monekers, has applied to the British Air Transport Advisory Council for a license to operate trans-Atlantic freight service between England and Montreal-New York. Initial service would use York and Tudor freighters and begin in June 1959. Avroco expects to load about a thousand tons of freight monthly in each direction with a semi-weekly service to both American terminals.

► Naval Air Material Center at Philadelphia has developed a device for accurately and easily measuring the striking speed of aircraft. An electronic impulser is transmitted from a radio altimeter in the aircraft and received by a Polaroid-type camera on the ground. Results are available as soon as the aircraft completes its landing.

► Pratt & Whitney Aircraft's latest version of the J48 turboprop-fan fighter with afterburner is now delivering more than 10,000 lb. thrust. It will be used in the Lockheed F-94 Starfire all-weather interceptor. Its original thrust was 6,250 lb. without afterburner.

► British are extremely anxious to expand their production plans for the Gloster Javelin, declassifying all weather fighter. Advanced technical advances to the MSA of short procurement programs forced the British to meet NATO's fighter requirements better than any was scheduled for procurement. Big mag blocking inclusion of the Javelin in the current off-shore procurement program is the 1955 delivery deadline set for NATO implementation.

► U. S. has tentatively agreed to buy 340 Supermarine Swift jet fighters under the off-shore procurement program, contingent on delivery by June 1955. As part of the contract, the British were required to up their Swift commitments by 140 planes, which has been done. The U. S. contract eventually may cover only 260 of the fighters, considering delivery date and lead time limitations. Observers are using RAF pilots well fly the Swifts ordered under NATO segs.

New Names, but Few Policy Changes

Outlook for Aviation Under Republicans

- GOP expected to accept fiscal '54 defense budget.
- But there may be major cuts in CAA spending.

By Katherine Jackson

Military aviation and commercial aviation, given their influence to many in the last 20 years of Democratic administration, now face for the first time the scrutiny and impact of a Republican President and Congress.

This is the outlook:

- Although there will be a wholesale change of face in less than two years, there will be no drastic change or reorganization of policies affecting commercial or military aviation as a result of the election. The major splits in aviation issues do not follow party lines. Republicans and Democrats have fought on many matters, but have had little real conflict in power, foreign military aid, armament, or policy, and maintained market competition.
- Most major aviation developments on the horizon will be more a result of domestic and international trends than the election.

• A shift in Civil Aeronautics Administration programs does appear certain. The 1950 Republican-controlled Congress slashed CAA money for the 1949 fiscal year by \$30 million to \$119 million and the following year accepted a \$157 million budget, though it had a \$100 million budget. These were years when the defense program was running under \$35 billion annually, and there was not the power to negotiate an civilian programs that there is at the present time.

• Republicans, though, are expected to move cautiously in continuing on defense which could have international repercussions. More likely, expenditures will be held down. This would result in a slowdown in delivery of planes, rather than in orders.

Defense

- How Much for Defense?—The Eisenhower Administration is reported to be going along with the 1954 fiscal year budget that has been drawn up by the department of Secretary of Defense Robert



Lovett, a Republican. It will not be far removed with recent year budgets. The total agreed upon is Lovett and the Bureau of the Budget is authorized to spend \$10 billion in 1954, up from \$9.5 billion and the following year accepted a \$100 million budget. These were years when the defense program was running under \$35 billion annually, and there was not the power to negotiate an civilian programs that there is at the present time.

• Republicans, though, are expected to move cautiously in continuing on defense which could have international repercussions. More likely, expenditures will be held down. This would result in a slowdown in delivery of planes, rather than in orders.

It can't be reflected on the 1954 fiscal budget.

• Civil Aviation Experiments?—For stronger than the desire to cut appropriations will be the drive to control defense spending. It is actual expenditures rather than appropriations that

stimulates program inflation and expenditures that determine the defense or surplus of the Federal Budget and the feasibility of tax reductions. This may be the Democratic House overwhelming voted a cutback on defense expenditures but it was lifted by the Senate. Rep. Frederic C. Gilman, outgoing Air Services Division director, found that when he presented the House with, he will have to use.

• More Unification?—Eisenhower will definitely recommend defense steps to unify the services by concentrating in theory and responsibility with the Secretary of Defense and cutting back service authority. He was consistent in the House Committee which recommended steps in this direction. But former Defense Secretary Louis Johnson's popularity and the prestige influence with Congress were reasons they were only partially enacted.

However, according to some speculation, one of the first to be proposed after the end of the Korean war is to reform and centralize defense procurement. This is the office of the top Secretary of Defense along functional lines such as research and development, procurement, production, maintenance, etc.

The House Committee's plan to provide authority to civilian the procurement responsible in the Secretary of Defense and setting those of the new agency in the same position as the defense departments.

He may only expand the duties of the Air Force buildup to 400 wings, but he provided the Administration to use General Force goals. His appointment in January was to work with the Truman Administration on the defense budget increases the prospect he will be given the responsibility. He will be the one Eisenhower may familiar with the civilian program. Lodge resigned from the Senate to serve as Army officer in the African and European Theaters during the war. Undoubtedly there will be a drive in Congress that Republicans will be able to negotiate an civilian programs in Ray Taber and Sen. Brooks, in case this whatever defense budget is authorized.

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Styles Bradgate, who originally had, but the black Brigadier will choose to head the subcommittee handling Senate Department funds instead. This was Ferguson pushed for substantial cuts in Air Force personnel and research appropriations, but he didn't go along with some of the cost-cutting package proposed by Major Ferguson, including the subcommittee which proposed the Hughes Research appropriations for 1947, as well as a proposal of its developed evidence that later Sen. Bennett Meeks, the former USAF officer in charge of Wright-Patterson AFB during the war, is guilty.

* Rep. John T. Teller, known as Congress' leading peacekeeper, is likely to head the Subcommittee on Armed Services, as well as the full House Appropriations Committee. This year, when the subcommittee was split in three to stand up action on the defense budget, Teller was making Republicans on the group heading USAF funds.

* Sen. Charles Tobey, in line for chairmanship of Senate Interstate and Foreign Commerce Committee, has been sympathetic to the nationalists as their fight with the scheduled industry. Realizing Republicans on the Senate Foreign Relations Committee, Tobey can also take on the chairmanship of that group which has spearheaded the rounded out in Capitol Hill. Tobey has not actively participated in aviation. The one exception appears to be his vote for international air service, as voted by PAA.

* Rep. Charles W. Wiggins, due to take over the chairmanship of House Interstate and Foreign Commerce Committee, has generally supported national committee positions. This year he led the speech of his committee, which recommended a bill which, if passed, would permit national committee legislation to limit the committee in being two limited to the scheduled airlines. He wanted the subsidy field opened to the unscheduled certificate carriers.

New Faces

In addition to Lodge, Eisenhower political supporters who may be the new faces at the Pentagon, among the defense program subcommittee.

* Robert H. McRae, recently Clearedhough congressional engineer. He headed the commission which worked out the 1947 reorganization of Congress, later advised the House Committee on reorganization of the Executive Branch. It is likely he is a high-priority appointment to the Pentagon.

* David Ingalls, a son of Pan American Airways, who managed Pan American's Taft campaign. For the present, Ingalls, now a congressional staffer for Eisenhower, he served as Assistant Secretary of the Navy for Aviation in the Hoover Administration.

* Sen. elect Stuart Symington, Asst Secretary for Air, following enactment of the 1947 Unification Act, Symington launched USAF on its way to the dominance it now holds over Army and Navy in the defense structure. A target on the B-36 conversion, Vice Capt. Taft, he was given a job in the Planning and Analysis Division. Symington was charged with brevetting the American Airways, who managed Sen. Robert Taft's campaign. For the present, Ingalls, now a congressional staffer for Eisenhower, he served as Assistant Secretary of the Navy for Aviation in the Hoover Administration.

* Sen. elect Barry Goldwater who de- fended Senate majority leader Ernest McFarland, compromised in the Army

* Senator Morgan Hamilton, New York Senator, former Air Force officer and winner of the Congressional Medal of Honor in Africa during World War II.

* Owen Brewster, defeated senator from Maine who was chairman of the 1948 Congressional Airlines Policy Board.

* Harry C. Canfield, defeated senator from Washington, who was a member of Senate Armed Services Committee, and served under Roosevelt in Europe as a colonel in the Army airborne division.

AF Criticized for B-36 Tornado Loss

A forthcoming Senate Preparedness Subcommittee report is reported to criticize the Air Force heavily for concentrating most of the country's B-36 strategic air force at the Carswell AFB base. Ft. Worth, which was not by a 125 mph distance from the base. One B-36 was destroyed and 100 others are at an estimated cost of \$45 million.

The report of the subcommittee is due to Sen. Lyndon Baines Johnson on Dec. 17, during the annual Wright Memorial Dinner of the Aero Club of Washington, D. C.

In 1950, Goldwater served as a pilot in India from 1941 to 1947. He is now a lieutenant colonel in the Arizona National Guard, serving as Chief of Staff for Air.

* Senator John Kennedy who has been right hand aircraft industry representative, may get a spot on Senate Interstate and Foreign Commerce Committee, which will handle the matter. There are two Democratic nominees.

"For the time being," McRae stated, "we must continue to take the cold-weather task of putting 'wavy eggs in our basket'."

"The fact of the matter, however," Wiles commented, "is that the Air Force is really incapable. It displayed the type of sense of overall security which was displayed at Fort Hayes on Dec. 7, 1941. Our position at the Pearl Harbor was not due to a lack of preparedness, military and Naval attitude of mind, a supercilious attitude that nothing could last us, that everything would be all-won'ts, that we were too good for our own good."

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WINS WRIGHT AWARD

John H. Shuler, vice president of Shell Oil Co., has been the recipient of the Wright Brothers Memorial Trophy for 1952 by the National Aerospace Arms for his numerous contributions to civil aviation. He will receive the trophy at a formal dinner Dec. 17, during the annual Wright Memorial Dinner of the Aero Club of Washington, D. C.

In 1950, Goldwater served as a pilot in India from 1941 to 1947. He is now a lieutenant colonel in the Arizona National Guard, serving as Chief of Staff for Air.

* Senator John Kennedy who has been right hand aircraft industry representative, may get a spot on Senate Interstate and Foreign Commerce Committee, which will handle the matter. There are two Democratic nominees.

"For the time being," McRae stated, "we must continue to take the cold-weather task of putting 'wavy eggs in our basket'."

"The fact of the matter, however," Wiles commented, "is that the Air Force is really incapable. It displayed the type of sense of overall security which was displayed at Fort Hayes on Dec. 7, 1941. Our position at the Pearl Harbor was not due to a lack of preparedness, military and Naval attitude of mind, a supercilious attitude that nothing could last us, that everything would be all-won'ts, that we were too good for our own good."

* David Ingalls, a son of Pan American Airways, who managed Sen. Robert Taft's campaign. For the present, Ingalls, now a congressional staffer for Eisenhower, he served as Assistant Secretary of the Navy for Aviation in the Hoover Administration.

* Sen. elect Stuart Symington, Asst Secretary for Air, following enactment of the 1947 Unification Act, Symington launched USAF on its way to the dominance it now holds over Army and Navy in the defense structure. A target on the B-36 conversion, Vice Capt. Taft, he was given a job in the Planning and Analysis Division. Symington was charged with brevetting the American Airways, who managed Sen. Robert Taft's campaign. For the present, Ingalls, now a congressional staffer for Eisenhower, he served as Assistant Secretary of the Navy for Aviation in the Hoover Administration.

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Some Policy Revisions Certain

GOP-controlled ACC to study foreign airline grants, development subsidies, zoning, other problems.

U. S. aviation policy is set to change in some respects while Republicans take over the civil-military Air Coordinating Committee. ACC decisions at least to consider in 1953 are policy on aviation of joint committee to move from one branch of government to another in the interest of economy and efficiency, and joint transport policies development, loans and grants to foreign airlines, and joint Air Force-aviation use of experts.

ACC membership includes one top-level representative each from Air Force, Army, Civil Aviation Board, Commercial Aeronautics Council (CAC), Navy, Post Office, State Department, Treasury, Budget Bureau and National Security Resources Board. All are political appointees. Major policies to be reviewed:

* **Grants to foreign airlines.** The Republican Administration may be reported to consider future application by foreign airlines for U. S. grants of aid. In the last six years, the ACC has granted Export Import Bank loans of \$55 million to foreign airlines, or guarantees for other use.

In addition, the CAC and its successor, Mutual Security Administration, have made grants totaling \$155 million for European nations to buy U. S. aircraft engines and parts—mainly from Air Force—the last four years from April 1, 1948, to June 30 of that year, most of \$45 million was made under ECA before Dec. 31, 1951. Since then, an additional \$10 million has been on military aid.

More commercial airline aid at a low rate has been granted mainly from their governments. In the case, however, the more the foreign airlines operate the more subsidy they can need—judging by CAC estimates for U. S. international operation. Many small intra-national airlines are noncompliant to an extreme. Their operations compete with U. S. operators, thereby raising or ending U. S. subsidy needs.

* **Reapportionment.** State Department CAC Budget Bureau is meeting at ACC, may take a new view of issue of grants to commercial airlines.

* **Joint use of airports.** The government contributes direct subsidy to development of civil jet airports in addition to the mail jet subsidies given without to guarantee their investments?

Conversely, almost four years ago authorized \$12 million in a "prototype testing bill" for transport development. But when Commerce asked for money in 1951 and 1952 the appropriations requests were turned down. Then ACC Chairman Donald Norrell proposed a bill

said to be important at that airport in question.

* **Other Problems** for ACC—There are also some new policy areas coming up for ACC decisions.

* **Federal zoning.** One that will require some ACC reorganization for a long period of time is a more centralized airport planning, the so-called managerial airport approach, as recommended by the President's (Doolittle) Airport Commission. ACC will help draft legislation covering removal of obstructions to navigation in city areas around airports—acknowledging the right of the federal government to delineate managerial land in some instances.

The government will enforce right to control use of an airport 500 ft above all privately owned airports and airways.

There is an effort now on this paradoxical problem yet. Congress decisions on it have varied over the years. So legislation is called for.

* **US Postpones in ICAO.** The Air Coordinating Committee must approve a resolution later this year to postpone entry into the U. S. in the International Civil Aviation Organization of the United Nations. For instance, military development programs in the world at the Navigational Despatch Board.

The Administration is in a special top-level conference referred to it by ACC and NDRC the 35 million ANTRC research budget in half, despite the fact that economy and long-range efficiency was one reason for reviving the "founding system" except and concluding its research through ANTRC.

Problems of joint development of regulations and specifications are largely technical. Policy decisions are largely administrative. Policy decisions have to be solved, the seemingly diverse differences among the technical and operational areas in Air Force, Navy, CAC and the military. However, when technical committee to disagree beyond the time when agreement might reasonably be expected, the policy makers may step in.

For the new Defense Department and CAC Research and Development Board to set the application date for a common navigation system, as agreed during the intra-agency process, the ACC and Air Navigation Development Board must be reorganized, because some powerful members of the intra-agency committee of a committee on air force systems.

* **Joint use of airports.** The ACC is the high court for decisions on whether the military shall share or take over completely the civilian airports it wants. Chicago's new airport O'Hare Field, built for the airways, is now a major point of contention.

How a Republican ACC order Enrich lower will view the behavior of civil and military air services office.



NIGHT STRIKE ENDED. A B-57 Superfortress jet bomber comes in to land. Below:



DAYLIGHT BOMBING is taken up by B-57s to maintain 'round-the-clock aerial bombing'.

Combat Report From Korea

AF Switches Tactics in Korea

Saturation raids by B-29s, B-26s have destroyed Rd^d powerplants, stopped railroads and industry, G-2 says.

By R. P. (Pepper) Martin
McCauley World News

TOKYO—On June 15, 1952, the eve of the second anniversary of the Korean war, a flight of 25 B-26s made a saturation raid on Communist gun emplacements, troop concentrations and supply lines in preparation of the Korean front. In effect, it was the Air Force's final answer to a pattern of pattern a pattern of close support and mobility in "Operation Strangle," a modified type of assault dictated by the United Nations Command's concern with keeping the peace talks on a lively even lead.

Within a few hours the Air Force was engaged in a bizarre question that it knew and understood—a carefully planned campaign to destroy the Communist surrounding facilities, supply lines, storage depots and of course, important civilian areas at the mid mountain areas between the Yalu River and the front.

To the last week of October the Air

Force had dropped 40,000 tons of bombs, 15,000 rockets and 200,000 gallons of napalm on selected targets. In all, 1,100 sorties B-57s used during night intruder raids, flew

5,000, and the remainder were by fighters bombers. Although the total does not include numerous P-51s and close support aircrafts, the assault north of the Yalu represented 80% of the total air effort during the four month period.

War Results—In capsule form here are the results of the effort based on information tap secret intelligence sources from aircrewers reports and refuges, bomb damage assessment photo graphs, and other secret reports made available to *AIR FORCE WEEK* by Colonel Mark Clark's G-2C headquarters.

- 30% of all hydroelectric generating plants in North Korea have been destroyed.
- Industry in general is virtually at a standstill.
- North Korea's excellent subway network is operating at less than 25% of pre-war capacity.
- A large number of railroads, roads and a non-deepening stream of food is placing a heavy strain on the Communist economy and military mobilization.

The rail lines not materially reduced the enemy's capability to provide logistical supplies for early winter present combat conditions, but they have prevented the Reds from accumulating reserves needed for a sustained ground offensive.

Answers to Criticism—The air offensive was a logical development in the Korean war. The bottleneck was static and the Communists were using the hill during the peace talks to rebuild a forthcoming attack, cutting off the northern end of the Yalu River. Some military analysts believed that some of air power, at a negligible cost of loss, might also make the Reds more amenable at the peace table.

Air Force was bitterly aware of the growing offensive assist from its failure to start off completely the flow of men and supplies to the front. The theory that air power can be decisive in war was being questioned. At the same time, the Far East Air Force leadership realized that effect crews of the emerging world had learned by the rapid and strategic attacks against the enemy's communications lines of supply and reinforcements. One general commented: "It's difficult to get an accurate status on the enemy's resources by letting the products out after they move in the combat or support areas."

Despite this handicap, the Air Force welcomed the opportunity to unleash its striking power. Now, General Clark's G-2 reveals what air power can do despite the standard limitations.

III at Orbit—Prior to the war North Korea had a fairly efficient industrial plant situated along the limestone on iron and steel plant that on an early year had produced 150,000 metric tons of steel and about 60,000 metric tons of ferroalloy steel, a chemical indus-



SUPPLY DUMPS near Taechon undergo saturation treatment by B-26s.



RAILROAD BRIDGE passes over railroad is B-29.

Bombers Raze North Korea



CHEMICAL PLANT on northeast bank of Yalu, destroyed by B-26s.



ROLLING STOCK ruined by lightbombers.



COLD MINE war 90% destroyed by Superfortress.

CAB Setup to Remain Intact

Principal change under GOP will be filling vacancy on Board; staff members are protected by Civil Service.

By Lee Moore

The Civil Aviation Board organization-like those of the Interstate Commerce Commission, Federal Communications Commission, and other quasi-public regulatory commissions-will not change radically when President-elect Eisenhower takes over.

The only real CAB staff reporting to the Board and its Chairman is fully protected by Civil Service.

The only real potential change is the appointment by Eisenhower of one man in all the present vacant on the Board-left in August of former Chairman Donald Nyrop. The only other real change is a modification of CAB procedures to admit more non-membership candidates to the Chairman's administration of the Board. That, too, may not happen, as proposed in fifth month, and who is designated Chairman, the confirmed because of the four present Board members guarantee CAB will go along pretty much as shown on policy and personnel.

That was the exact intent of Congress in passing the Civil Aeronautics Act of 1938. The act provides that a maximum of three of the five members shall be of one political party. That is designed to place the Board above partisan politics. The act provides maximum tenure to membership appointments to put them individually at the other's disposal.

• **CAB Members to Meet** Congress and the White House-indirect and government interests modified at an early post-election suggestion that all CAB members should "make available their resignations and thus give the new Chief Executive a free hand in making up a new Board" and that "it would make a lot of sense to leave the choice up to the White House."

These observers pointed to the bipartisan nature of all regulatory commissions-membership set up by Congress in the past 10 years-and CAB members could be expected to leave because a new President comes in, as also could FCC and other quasi-judicial commissions.

The last section of the Civil Aeronautics Act (Sec. 201(a)), in clear as that point, states that the authority, not the Board, "shall be composed of five members who shall be appointed by the President. In and with the consent of the Senate . . . The members of the Board shall be appointed for terms of six years . . . The members . . . may be removed by the President

for inefficiency, neglect of duty, or malfeasance of office (otherwise). No more than half of the members shall be appointed in any one year.

CAB members are the last word except for the courts on domestic airway regulation. In international cases, where the President has superior power under the Constitution, he can and often does override CAB.

So the Senate CAB is set up by act of Congress as a confirming body, with only one member per year cast votes on the Board-left in August of former Chairman Donald Nyrop. The only other real change is a modification of CAB procedures to admit more non-membership candidates to the Chairman's administration of the Board. That, too, may not happen, as proposed in fifth month, and who is designated Chairman, the confirmed because of the four present Board members guarantee CAB will go along pretty much as shown on policy and personnel.

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• **CAB Staff** Chairman-The other side of the Board is on Civil Service status. Board staff are there now, as are Board members for a long post-election suggestion that CAB staff executive jobs are "open at the discretion of the White House."

No CAB staff appointment has been formal through the White House, according to Board Secretary Major C. McMillan and Executive Director James Verner. No one has been appointed or executive order providing for appointment of CAB staff to any but the Board Chairman and members.

The staff executives are "Schedule A" appointments under Civil Service rules. That can be changed to "Schedule C" if some jobs may not be filled except for reason. The "Schedule A" freedom in filling and changing the top spots is provided to enable the Board to select executives who are sympathetic with the overall policies of the Board majority.

• **Aviation Week** The three top Civil Service "upper grade" jobs at CAB were filled by permission of the Civil Service Commission, not the President. Once the job and salary are permitted by the CSC, the Board staff appoints the man to fill the job without reference to any

outside government agency. Three out of the five members must approve the appointment, and in practice all five members approve a man before he is appointed for a top CAB staff job. The "upper grade" appointments subject to CSC review (not White House) are those to change the General Counsel (Eugene T. Nesterov, Jr., and Bureau of Air Commerce Director George Bass (\$12,000-\$12,800 a year) and Executive Director James Verner (\$17,000-\$17,800 a year).

The expected CAB modification of the Chairman's staff administration is: shareholders also will lose little or no effect on the staff, except to make sure that they bring and stay in directly or indirectly up to a five-man Board rather than the possible whos of one man the Chairman. Otherwise CAB gets on as before. Police clauses will stay only as the membership majority conserves savings with new members appointed over the term to make sure that President's appointments to shareholders and the Civil Aeronautics Act. The staff of the four members to be appointed to Civil Service and by the Administrative Procedure Act of 1946.

► **Efforts to Change Policy**-While CAB members and staff are protected by the favorable terms in the Civil Aeronautics Act, there will be strong efforts by outside interests to void the switch to COP to no change.

The big surfaces are about to engage

in a fight for profits considerably higher than the 7% to 8% historically considered by CAB in "fair and reasonable" under the Civil Aeronautics Act. They argue that they send big profits in the air to the public. It is not clear that their big profits are temporary later. If the Republicans are more inclined inclined to not business profits as their platform states, the surfaces want to get to it. However, the influence must be reduced under the letter of the Civil Aeronautics Act. CAB makes its own decisions, except on international routes where the White House may direct.

The contested surfaces looked for further help from the Spokesmen Small Business Committee under a Democratic Administration. Now, without that, the small surfaces will have to take the fight to the Board members, who will then turn their fire into more positive fighting against federal bureaucratic restrictions passed by CAB to protect the "certified airfield" mostly favored by the Democratic wings of the 1930s.

Conversely, observers forecast it will take at least a year and perhaps more for surfaces big it need, to change the Civil Aeronautics Act in their advantage. Their best bet appears to be influencing the President's appointment of CAB members to vacancies on the five-man Board.

EEMCO technical bulletin

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AERONAUTICAL ENGINEERING

New Frontiers of Aeronautic Engineering

• Here are the guideposts to tomorrow's advances.

• By-pass engine, wing schemes are rich fields.

By David A. Anderson

The frontiers of aircraft engineering have never been static and aren't now. New developments, new techniques, new approaches have presented, to plumb and mainly mapped large areas of aeronautic knowledge.

out with its penetration rule, each race to the clouds has been measured, first with the longer fields ahead, and another tall beyond that hill.

Today aircraft engineers are looking ahead to face exploration of tomorrow. Here are areas of their guideposts—advancements in aircraft powerplants, aerodynamics and structures.

By-Pass Engines

The recent disclosure of the Bally-Steph. Convair (BSC-2)—believed to be the world's first bypass engine—has added still another to the lexicon of aircraft frontiers.

Here's why: the engine was designed primarily for the purpose of saving weight and space. This is accomplished, and of large measure, the engine generally is called a ducted type. If the fan is unidirectional and of small diameter, the engine is called the by-pass type.

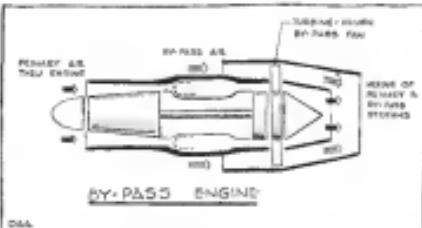
And the essential difference between these two types is one of degree and not of principle. At high mass flow, the by-pass engine can generally have ducted fan, if the fan is small by mass, low mass flow can have a by-pass type. □

How It Works—Dividing the airflow, the engine increases the overall aircraft air efficiency of the jet system. It does this by lowering the discharge velocity of the jet in a value which approaches the aircraft's airspeed.

Proportion efficiency of a jet system is a function of inlet and outlet velocities of the air. Efficiency reaches its maximum when the discharge speed is the same as the flight speed. Current turbo jet aircraft speeds are approximately 1,000 mph. Transport or booster flight speeds of 400 to 500 mph result in efficiencies of 40% to 50% with much jet velocities.

The discharge velocity is lowered by the power requirements of the fan, which must be exact by the turbine. This adds power—and therefore jet velocity—at the gas turbine. The cooling effect of the bypass air also tends to reduce the jet velocity, as does the mixing of the primary and secondary gas streams.

• **More Wings—**There is a variety of



wings and yet the trip—on by-pass around the compressor and burner and turbine sections, to be mixed with the primary air stream in the exhaust.

By-pass air is removed mechanically by a fan driven from the turbine stages of the primary engine. If this fan is unidirectional, and of large diameter, the engine generally is called a ducted type. If the fan is unidirectional and of small diameter, the engine is called the by-pass type.

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wings to handle the flow geometry, because there are a variety of planes in the cycle when air can be diverted.

For example, the propulsive air stream can be peeled off the engine ahead of the compressor, after a couple of stages of compression, or at the rear of the compressor. It can be diverted from a common inlet with the primary stream, or from separate air streams ducting.

But as always, you don't get something for nothing. The by-pass engine is heavier, although it is well-constructed of unique but flat for a given mass, it will be lighter than a comparable turbojet engine. The propulsive stream and the bypass stream are each a separate ducted system, designed for a particular set of conditions, and if the conditions change, the engine has to be redesigned.

The mechanical drive for the fan is complicated, and so is the ducting which handles the ducted flow. Not enough is known about mixing of cold and hot air streams to be able to predict characteristics of the engine with any degree of exactness.

• **Wings—**In a class, the by-pass engine that has been flying during World War II, the B-52, has been studied by the Germans and British were copied to the stage of not much.

In England, Metropolitan-Vickers developed its F.2 gas turbine in the F.2 ducted fan and the F.5, an open fan (by-pass) engine. The French firm of Turbomeca has recently built, tested and flown its small Atar 101 ducted-fan turbojet.

The B.R. Conway is the latest in this series of powerplants which will find wide applications in the forthcoming aircraft of tomorrow.



HOW DORSCHMANN — Figure A, lead-wire in a conventional A.R.C. Aeronautics wing, shows the wing leading edge deflected 10 to 20° to the horizontal.

CHINESE AIRLINES — Figure B, lead-wire in a conventional A.R.C. Aeronautics wing, shows the wing leading edge deflected 10 to 20° to the horizontal. Deflection effects concentration among the leading edge airfoil sections, resulting in increased lift.

CHINESE AIRLINES — Figure C, lead-wire in a conventional A.R.C. Aeronautics wing, shows the wing leading edge deflected 10 to 20° to the horizontal. Deflection effects concentration among the leading edge airfoil sections, resulting in increased lift.

Write for data on any of these or write to our A.R.C. headquarters.

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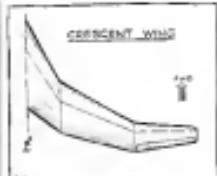


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Austin Lead-wire — Model B is used to convert the conventional aircraft indicator to a single dial.

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Crescent Wing

At the SBAC display at Farnborough, England, a model of the Handley Page jet transport was displayed, shown in its wings. The reason military aircraft showing the crescent wing. At about the same time, David Kamm, aeronautical engineer at Short Brothers, Ltd., Hartland, was preparing a lecture on wing development, which contained a section devoted to an explanation of the crescent wing. Further, the lecture passed the wing to Handley Page development.

This new kind of wing phenomenon is called the "Sonic" wing, a legend in which the angle of sweep back varies from a minimum at the root to a maximum at the tip. It can be a continuous variation, which produces curved leading and trailing edges, or a step function, which produces straight line segments of wing.

Aerodynamic problems, for example, are compounded by the curved nature of the aircraft wing face.

Repose — Think of a highly swept wing with a load applied at the tip, such as it would result from aircraft deflection. The wing starts to deflect, the point of load application is well below the neutral axis of the wing. Then the wing begins to twist. In the case of aircraft reversal, the load at tip increases due to this twist causes a loss of wing lift. The twist then balances the increase in wing lift due to aircraft deflection.

The crescent wing minimizes some of this problem, because the wing tip load is applied forward of the wing axis. Torsional deflection due to tip loads per class lift factors which add to those produced by a twist.

That's a dividend in the cost of wing gravity, which is paid off as reduced weight in tip loading. Reason for this is the reduced angle of sweep at the outer portion of the wing. Consequently, stresses stay solid in the lower portion of the flight range, and likewise stay solid on a straight wing.

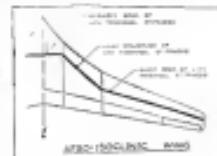
The Cost — Pay for these steady state advantages is structural cost.

The wing is bound to be a little heavier because of the layout. Wings have

to be very thick in order to compensate for these lack of sweep.

This layout can be expected to apply to wings of high aspect ratio, wings for implants in the bomber and transport category.

The pioneering work on the crescent wing was done by Arado in Germany during the war. In the postwar period, Handley Page picked up the idea, developed it, and built it to the H.P. 80 long range bomber and the drawing board H.P. 97 jet transport. A development aircraft, analysis-built from a Supermarine Attacker fuselage and fitted with modified tail and a crescent wing, was designated the H.P. 88. This craft reached after the pull-up from a low level, high-speed pass, indicating that there is more to the problem than aerodynamic layout.



Aero-Isoclinic Wing

The isoclinic name describes a constant strategy for maintaining constant wing incidence, regardless of loading on the surface, and regardless of deflection.

The strategy consists of making the wing structure with a combination of torsional influences, live in one area, high in another.

The unusual arrangement of load carrying members permits a combination of wing bending and torsion which results in no apparent change of structure under load.

One unusual layout of such a wing is to build a torsion box which has its main beam at 90° to its possible, perhaps 50 to 60% of the chord. Since normal flight loads are applied somewhere around the quarter-chord point, an increase in air load will produce a nose-up twist of the wing around that torsion box.

This is important in accelerated flight which builds up air loads on the wing along their normal vector, such as a pullout from a dive. In a sweeping aircraft with constant incidence in the individual wing, spanwise bending airfoil load tends to reduce the incidence toward the tip. This is a simple matter of geometry, and occurs with a stiff, unwarped wing.

As the tip section decreases incidence,



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they also lose lift. This loss of lift is caused by the upward center of gravity of the aircraft's wing sweep angle. As the aircraft feels a nose-up pitching from the altered lift distribution, this tends to tighten the payload, and increase the lift further because of increased G in the weight. Further increase in lift loads the wings more, which means lift at the top, produces more nose-up trim drag and tightens the payload. The structure can follow.

► English 1104-11 H. Condar, aircraft and design of Vickers Armstrong, addressed one hazard for an aeroelastic wing. It is, in effect, a structural hinge point at about the quarter span of the wing panel. The hinge has to be so arranged that the loss of incidence when bending is balanced by increased incidence due to rotation.

The hinge problem of the structure is based on a beam which is upright, carries bending loads and has high torsional stiffness. This is the "anchor" for the hinge.

The hinge area could be a two way structure of members, and the spruce spar could be hinged landing gear. ► Origin—The first thinking on the aeroelastic wing was advanced by Prof. G. T. R. Hill of University College, London. Condar and Rothman mentioned the type in recent lectures, with the added indication that the largest advantage would be gained when the requirements called for a wing of high aspect ratio.

This points the way to future applications of the semi-aeroelastic wing in long range aircraft. The aeroelastic wing is a sharply swept wing. Certain effects of multi-surface potential, increasing distance—designed for transonic flight range, might also benefit from such a structure.

Hydrofoils and Skis

Tomorrow's flying boats, like the large biplane and passenger aircraft of the 1920's, will not resemble the straight hull configurations that we're used to today.

Lauded, launching and landing will be made with combinations of airfoils to operate under water, and planing over to dip under the top surface. These new wateroperating fins for the surface designer go under the names of hydrofoil and hydroski.

Current interest in these developments stems from U. S. Navy position on the highspeed flying boat for fighter

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Precise machining is costly. Wright Aerocraft safeguards the spines of this crankshaft assembly with a protective wrapping of Permacel 77.

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The photos shown above are typical designs that incorporate Aerotec Automatic Controls. The Republic P-47 Thunderbolt, a multi-purpose craft, uses Aerotec pressure switches and a new dual float switch combination for top or bottom mounted fuel tanks. Boeing has long used Aerotec valves, float switches, and pressure switches on their famous planes.

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Fastener Problem of the Month

BRUNN CENTERPIECE

NOVEMBER, 1962



PROBLEM Acceleration forces up to 10g are developed by the world's largest human centrifuge, a device for testing high speed maneuvering in space vehicles. Built by the McNeilton Corp. for the Naval Air Development Center, Johnsville, Pa., this giant machine whisks a gondola horizontally, can move from dead stop to 175 mph in 7 seconds. When the 30° arm rotates, huge torque loads tend to pull the different sections apart. The fasteners selected had to be not only exceptionally strong, but also able to hold fast in spite of the fluctuating stresses and the vibrations involved.

SOLUTION The largest torque load on any of the arm's four joints is 250,000 lb-in and is carried by eight interval bolts and self-locking vibration proof Elastac Step Nuts. A strength test of a sample joint showed that the steel tubing failed first, without damage to the joint flanges or the bolts and nuts. An other vital spot is the Wright slot between the two halves of the gondola. These shells are clamped together with 388 bolts and Elastac Step Nuts. In fact, all important sections of the centrifuge—the base, sections, the counterweight, the gondola, the three outriggers opposing the gondola—do in the same manner with Elastac Step Nuts. The holding quality of these nuts, the unique vibration resistance they offer, and the non-destructive inspection. When strength and fastened security are needed, they prove it.

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front shears onto the smooth surface, and the main shock strut takes up some of the impact energy during certain of the logic sequence.

Flexible piping is entirely eliminated in the Dowdy design, and there is no external plumbing of any type.

There is only one shock absorber which simplifies maintenance problems—and moving parts are at a minimum, says the company.

Dowdy says suspension alloy castings are extremely light in weight, and that fact, plus the use of a single shock strut have resulted in a unit that is twice as light as its predecessor. Logos are all aluminum and extremely light in relation to the overall weight.

New Turbojet Alloy

A comparatively new cast aluminum alloy, developed at Wright-Patterson AFB, Dayton, is being used for light weight, high temperature applications.

Known as ML aluminum alloy, the material contains approximately 9% copper, 2% nickel, 2% magnesium and small percentages of titanium, manganese, aluminum and vanadium, according to International Nickel Co., Inc.

Wright Aircraft Division of Curtiss-Wright Corp. is using the ML material for the motor case, bearing support and miscellaneous parts of its 367-Supersonic engine. Photo below shows ML test cells.



TWO-STORY TEST CELLS

Double-decker jet test cells save space at Curtiss-Wright Corp.'s Wright Aircraft Division. Photo shows 367 Supersonic being tested in its two-story test house for proving new fighter aircrafts launching the building field at extremes of sound-deadening insulation.



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Tube Size	1/2"
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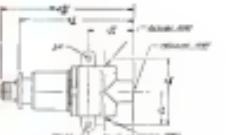


Valve No.	412950
Ports	2
Tube Size	1/2"
Weight, pounds	8



These solenoid-operated two and three port control and depressurization valves are now in volume production.

Designed specifically for low flow applications, where pressure drops is not a problem, these valves offer the rugged simplicity of direct acting coil bypass. They are designed for 1000 psi operating pressure (3340 PSI) and the solenoid operates at 18-25 volts DC. Some models are immediately available from stock.



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GAGES INSTALLED on underside of F104 Starfighter wing. Large circle (lower center) is enlarged view of the lower load gage installation.

Simple Gage Shows Plane Stress

A simple device has been developed at the National Bureau of Standards for safety-checking aircraft structures. It is a limit load gage that indicates visually whether basic structural components of operational aircraft have been stressed beyond values which are considered safe.

Developed for the Navy Bureau of Aeronautics by the NBS aircraft structures group, the unit has proved its worth in extensive tests on lighted jet and piston engine planes. The gage should find use in other types of aircraft, other potential applications should be determination of overload conditions, loadings and other heavy structures.

► **Gage Parts**—Components of the load instrument are an arm, a base and gage points (small plates). The device spans only about 3 in.

Gage points are hardened steel inserts with knurled edges for proper engagement with the steelshell component, it avoid loosening in flight.

Arm is made of 718-T to reduce thermal expansion effects while the gage is used as the base material. It has a hardened steel tip to prevent excessive radii from developing from tip wear.

Base also is made of hardened steel, it is dovetailed into a 4-in. square for 1/8-in. deep, each dimension approximately 2,500 mils, for one type of gage, 5,000 mils, for another type, when used on aluminum alloy structures. There is a linear relationship between lateral de-



LIMIT LOAD GAGE'S only components A, arm, B, base, C and D, gage points, E, are shown. Tip E is set to overlap base several microns by distance equal to the gagepoints to be balanced. When testing is completed, if it has been at the gage points, one springy tip of one arm

placement of the arm and the base dimensions.

► **How It Works**—Operation is simple. Arm is usually set down the axis of a cracked position. The gage indicates cracked when gagepoints touch each other. The tips just touch the base edge.

The gage is mounted as a structural member by means of two drilled and tapped holes at the desired location. The holes are drilled so that the arm tip will contact the base. The arm axis is obtained by placing the arm up on the horizontal axis project, then rotating the arm until the arm springy clear.

The required overlap setting can be determined from a calibration curve of the gage. Young's modulus of the gage is used to which the gage is attached and the strain level at which indolence is desired.

► **No Wear Effects**—Because appreciable wear of the arm or arm tip would

give a change in arm setting and in the calibration curve, wear tests were performed.

The gage was mounted on a specimen suitable for use with an Avery fatigue testing machine, then given a position and a little load, then the strain required for the gage to indicate. After 30,000 cycles, some load and strain were measured. The gage indicated the calibration was checked. There was no evidence of wear, and the calibration curve passed the same.

But it was found that the gage points would loosen if they were not initially gaged axially.

► **Setting Not Hard**—NBS checked the assembly with which the gage could be set by different methods. A set of these values and a calibration curve were given to each person tested, to set the gage. The gage indicating load was determined by applying a tensile force to a rod for causing the gage.

After a few trials, it was shown that an operator could indolence with the gage could set it to a given value of 700 psi. □

► **Approximate**—The load limit gage generally is mounted on the tension surface of a beam subjected to bending. Effect of bending was determined, as well as account of the correction necessary to account for the condition that the arm tip is normally 3 in from the base surface.

Tests showed that to have the gage arm drop at a surface stress S_0 , it had to be set for a stress of $3.03(C+1)/C$, where C is the number of the strain gage points from base surface to the non-tension surface.

To the heightened lighter plane stress, the gage was mounted at three positions on the wing. On the wing surface, directly under gage location, was placed with strain gage. After flight of simulated dive bending and straining, the recorded outputs of the strain gage were compared with the load limit gage and found to agree within 15%.

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Centrifuges Test Missile Assemblies

A series of centrifuges that can be used for operational testing of components and assemblies is under development by the Radex Co., 4225 Helix St., Oakland, Calif.

A typical Radex unit now being installed at a guided missile development center will test components up to a weight of 600 lb at simulated loadings of 60G. Lighter specimens can be tested to higher values, but profits up to 4 ft long or 14 in. across can be accommodated.

Test configurations include 45 electrical

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equal mounts and eight electrical power leads, a control cable, a wiper blade and high pressure hydraulics, as well as fuel connections. These run from the cartridge test mount to the remote test and can test rates.

Hydraulic drive of the rotor gives a 60°-60° variable speed regulation. Safety controls prevent inadvertent start unless the jets are clear of personnel, emergency stops are handled by either air or solenoid hydraulic and mechanical braking systems.

Percival Developing Jet Copter Engine

Development of the lifting unit for a jet-powered family of helicopters is well under way at Percival Aircraft, Ltd. of London, England. The company is studying the jet-copter plan for commercial helicopter production. The proposed jet-copter will have a capacity of 12 passengers. The aircraft will be designed on these terms to the layout of fractional containers for the easier inclusion of either passengers or cargo or both.

The powerplant will be a special gas-turbine engine, fitted in at near the fuselage. Breathing high-pressure gas from that unit will be piped through hollow propeller blades to the tips, where it will be ejected at high speed. The reaction to this breathing will rotate the blades. Afterburning will not be used in the new engine.

Percival will not use the blades and powerplant in a ground-up design stage yet.

Building Program Pushed by McDonnell

New-finity projects are being pushed at McDonnell Aircraft Corp., St. Louis, to achieve an integrated production and experimental plant for aircraft and guided missiles.

Already completed is a new 55,000-square-foot flight test hangar, scheduled for partial occupancy in December. A new padding facility adjusted to the hangar is now ready for partial use. Another completed project is a massive laboratory for electronic tests.

Under construction are a two-cell aircraft propulsion laboratory and a low-speed, three-story windtunnel, each costing \$1 million. The propulsion lab is tagged for completion by December and the windtunnel by March of next year.

The propulsion lab will have an associated shop area accommodating about 50 people. Top left of the wind tunnel building will be used as an operations room. Models will be lowered from the operations loft to the square test section.

New!

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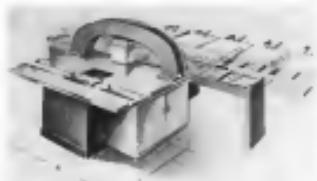
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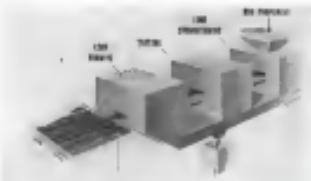
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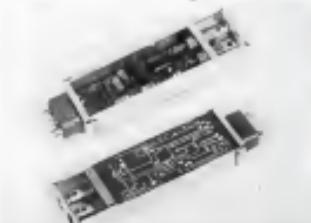
ASSEMBLY of electronic components will be done automatically on a GE-developed machine similar to this. First it is to be delivered in late 1953.



COMPONENTS such as conventional type resistors and capacitors will be tested, and have their leads cut and formed on a machine like this one.



PRINTED CIRCUIT fiber plate is base on which circuit boards will be mounted. Prepared components under guidance of punched card instructions



SOLDER DIP will secure components and make electrical connections, after which fiber plate will be mounted in plugin chassis, as illustrated above.

Automatic Factory Near for Electronics

GE developing machines to prepare, test and place conventional components in printed circuit units.

By Philip Klass

General Electric is developing machinery that should soon make possible the completely automatic manufacture of printed-circuit electronic assemblies using conventional-type components.

The findings that GE is seeking, for the Signal Corps, on warplanes for the electronic test building, and placement of conventional-type components in printed-circuit boards was announced by R. A. Gerhold of the Signal Corps Engineering Lab in a paper delivered at the recent National Electronics Conference in Chicago. It was particularly noteworthy because the electronics in

drugs, by its very nature, has long defied mechanization.

GE expects to deliver the first experimental version of the key automatic factory machine late in 1953, according to a spokesman.

The Needs-Growing military use of electronics in air, ground and sea assets, and the advent of explosive guided missiles such as those caused full of interest, year, has led to a demand

for the Signal Corps to replace vacuum tubes. While tubes have been produced by fully automatic methods, the new transistors have been manufactured by semi-laboratory methods. This explains recent Signal Corps contracts to GE, Raytheon, Sylvania and RCA to develop automatic methods for producing, assembling, and testing transistors.

Advantages—One of what makes the new automatic factory type equipment under development by GE so unique is

its speed. Automatic machinery can be operated for 24 hours a day, seven days a week, with no time out for break, test periods, or shift changes, and only occasional down

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Aviation Materials - Components and Assembly Line

Published by Graybar Electric Company, 274 pages. The 5 1/2" x 11" volume, printed on coated stock and illustrated throughout with full-color, half-hundred of electrical items in constant use in airports and used for the assembly line. Written and edited for the convenience of men in the aircraft field the book represents the most comprehensive catalog ever available to this highly specialized industry. In addition to test data, illustrations and

specifications of parts and materials, the book carries many reference tables of great value and convenience. Tables on wire, for example, list AN sizes, AWG sizes, number of strands, ap proximate bare diameter, shipping weight in pounds per thousand feet, maximum overall diameter and maximum trigger weight in pounds per thousand feet. More than 200 separate items are listed in an alphabetical, easy-to-read index.

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time required for their manufacture.

- Improved quality. As long as the conductors function properly, every assembly should come out correctly wound and up to required quality standards. This should in turn reduce inspecting time.

- Flexibility. Because manufacturing automation (for the machine) will come from punched IBM-type cards in tape, a production line can be quickly converted from manufacturing one type assembly to another. Changes will require no "learning-time." In the assembly line, the line can adapt to fall speed sheet metalworking.

- Less manpower. Practically all of the hand labor operations associated with present-day manufacturing methods can be eliminated and less-skilled personnel can be used where operations are necessary.

►Outgrowth of "Auto-Assembly" — Gil's program is a logical continuation of the earlier-developed Signal Corps technique called "Auto-Assembly." "Auto-Assembly" uses a fiber mounting board, or "cord," on which are printed the contacts necessary to interconnect the components.

In its initial concept, conventional components were mounted by hand on the cord by inserting their leads through small punched holes in the cord. After component installation, the entire bottom half of the cord was quickly dipped into a hot bath of solder, securing the components and connecting them electrically to the printed conductors.

This technique has proven attractive because it eliminates:

- Major portion of hand labor operations (bushing, reaming, crimping, welding).
- Changeover time normally required for different repetitive work.

As a result of this technique, Gerber and one manufacturer cut his rejection rate to



ANALOG A/D

This four input function generator can be used to simulate the effects of loadshift, deadzone and hysteresis in solid-state analog computer studies of servo system design problems. Made by Computer Corp. of America, the new Model 7002 offers computer input signal to be continuously varied by push switches. Device can be used with such using computers as the RING, GEDRA or RDA, the latter manufactured by CLEA, 140 Church St., New York.

HEADQUARTERS

AIRCRAFT ACCESSORY DRIVES

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Prototype Production

Quantity Production

Just a few of the many drives produced by Western Gear Works for aircraft-engine accessories are illustrated on this page.

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1/20 of that experienced in hand-wiring operations.

General Electric first applied this technique commercially to a pair of its last of television sets early in 1953 and has made increasing use of the auto-winding technique, in both other manufacturers.

► Next Step—The Signal Corps has now taken the next logical, but the most difficult, step toward complete automation. That is the automatic placement of printed components on the printed-circuit card. This might not seem so difficult, but it has been the problem never cleared.

The equipment must be designed with sufficient flexibility to handle a variety of different components and be capable of changing from one type assembly to another in short order. A more fundamentally difficult problem arises in the components themselves.

Component substitutions long accustomed to varying slight relaxations on the electrical characteristics of their products, have never attempted to justify changes in the outer physical dimensions of these components. When components are completely positioned to within .005 in. in the automatic installation, variation in component dimensions can present a major problem.

► Component-Type Components—The Signal Corps decided to build its automatic factory around conventional types of switches, capacitors, etc., because these components are reliable and proven. Considerable effort has already gone into improving their quality and reliability.

At least for the present, the Signal Corps plans to have reported the printing of graphite resistors and resistors in the later card to control resistance and capacities, because these techniques are not yet sufficiently accurate or reliable for volume equipment.

John's John Surgeon developed an automatic machine in the late 1940s which could turn out five-hundred-pair element, printed-component superhet-type receivers at the rate of 300,000 sets a year. Only the tubes, transistors, diodes, resistors and the local oscillator had to be entered by hand.

► The New Model—General Electric is developing three different types of machines for the Signal Corps.

► Component Preparation. This device will test each component electrically, reject defective, and then cut and form the leads as required, delivering the component to the Component Carries.

► Component Carrier. This device will load components into trays, code the trays to identify the specific type component, and deliver the trays to the Component Assembly machine.

► Component Assembly. Printed cu-



In This
NEW *Bendix-Pacific*
TELEMETERING COMMUTATING SWITCH

Convenience of telemetering subcarrier oscillator input voltage or pickup output at high sampling rates can now be provided with this new Bendix-Pacific TSC-15 Commutating Switch.

The TSC-15-Commutating Switch is a three pole switch having 60 contacts per section and sharing type contact wipers. Non-sharing type operation may be obtained by connecting in a alternate contacts giving 30 circuits in each section with 60% duty cycle. The wipers are adjustable for synchronization of all sections.

Long life has been engineered into the switch through the use of heat treated precious metal contact pins and wipers. The contact plate and wiper are completely enclosed in an aluminum housing which is attached to a small permanent magnet motor having an integral gear train and governor.



SPECIFICATIONS

Rating Voltages: 0.1 to 24 milli DC.
Rating Current: 300 to 500 milli.
Operational: Adjacent pins 0.8 milli.
Allowable pins: 2.5 milli.
Allowable short-circuit: 10.2 milli.
Contact life: 100,000 cycles.
Gate-to-base input current: 1.67 milli.
Temperature range: -50°C to +100°C.

Activation: Self-locking to 40° along
Weldless Substrates in 10 G at 8
frequency of 22 sec to 10 GHz.
400 cps rating any ratio.
Operational: 2.2 sec. absolutely.
A/F ratio: 1000.
Weight: 1.15 pounds.

Write for complete
information



and tools, with interlocking and pre-punched holes in some component leads will be used for this machine as will the type casting used components. This machine will lower component individuality, positioning the plug-lead and to increase component leads. Later the lead will be automatically connected to a lead holder for the clipping. The component leads will be connected to the main lead line.

pleted and will then be ready for installation in the plug-in circuit.

for
AIRCRAFT ALLOYS

Specialization	Scope	Analysis	Conditions, etc.
MLB-5 5000A	Rev.	4140	Emuls., Sodium, Merc., Phen., Billets, Annealed
MLB-5 5000B	Rev.	4140	Rounds, Hex., Hex., Merc., Annealed, Round
MLB-5 5017	Rev.	4120	Rounds, Square, Hex., Phen., Billets, Annealed, Merc., Annealed Billets, Annealed, Hex., Trussed
AMS 2024			
AMS 2025			
AMS 2026			
AMS 2024		E745	Modified Annealed Rounds
AMS 2025		4120	Annealed & Normalized

AIRCRAFT STAINLESS

Speciation:	Shape:	Analysis:	Conditions, etc.:
MIL-5059	Sheets	Type 329	30 and 44 Foothills
	Fl. Family	Type 301	30 and Full Hand Tissue
	Sheets & 250s		
MIL-5-6181	Sheets	Type 324	30 Foothills
	Fl. Family	Type 321	30 Foothills
	Flakes	Type 321	Fl. Roll, Anaspid & Pickled
MIL-5-7103	Beds	Type 303	Brands, Squeezes, Hemis
AMS 5510	Sheets	Type 291	30 Foothills
AMS 18291	Sheets -	Type 310	30 Foothills
AMS 5510	Beds	Type 414	Brands, Squeezes, Hemis
AMS 5543	Beds	Type 303	Brands, Squeezes, Hemis
AMS 5641	Beds	Type 391	Brands

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www.wiley.com/go/linckens/1000

New TVOR Sells "Under \$10,000"

The small station (top) at College Park, Md., airport houses a new low-cost TVOR (terminal VOR) station manufactured by Maryland Electronics Mfg. Corp. The new TVOR unit can provide low-power VHF omnidirectional and instrument approach facilities at small airports not equipped with GAA-licensed VOR and ILS facilities.

Low overall shelter and antenna height allows TWCOR to be located on overhead, cutting installation costs and allowing it to serve as maintenance approach locator. Maryland Electric's six units should be available by August, 1990.

Complete TVOR equipment, including 50-w transmitter and television monitor to shut off station in event of malfunction, is contained in this "pack age" which operates from standard 110-v 60-cycle a.c. Power source for

WHAT'S AHEAD OF THE INFANTRY

THE *Cessna L-19* BIRD DOG

...desirable popular servant of the Infantry, itself!

Today, hundreds of these light L-19 reconnaissance planes roost over enemy lines, picking for targets, directing air and artillery fire, supplying isolated UN troops, transporting important military personnel and equipment, in short, serving as every infantryman's own personal "air force."

Equally proud of these sturdy L-20s are the men who fly them, veterans Army and Marine aviators who praise the Bird Dog's powerful 213 HP engine, its all-metal construction, visibility, shock-resistant landing gear, high-lift flaps and multiple-installation radios (for contact with both air and ground units).

What does it all mean? First, more up-to-date, usable battlefield information. And that, of course, means easier missions. But most important, accurate intelligence saves GI lives. That's a combat-proven fact!

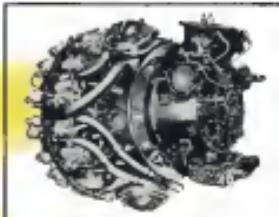
We at Cessna are increscendally proud of the L-18s and we're building them as fast as we can. A solid 80% of us think it's a home run.

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Douglas Skymaster



Wright Turbine Compound Aircraft Engine

they fly on Wright Engines...

with THOMPSON VALVES



Martin Marlin



Lockheed "Super Constellation"



VALVE DIVISION

Thompson Products, Inc.

CLEVELAND 17, OHIO

voice transmission on the TVOR, frequency which can be tuned to any spot in the 100-to-115 mc band. Any three-letter station identification can be set up on the equipment, the manufacturer says.

Low-cost TVOR, designed to make "all-weather" appearance on all small navigational and low-altitude flight aircraft, is an outgrowth of an Air Transport Area project started earlier this year. ATA built a TVOR and made frequent comparisons and tested it to prove practically of much a low-cost alternative (Aviation Week May 5, p. 68; June 9, p. 68). Wilcox Electric Co. has manufactured its own TVOR, and Bellanca Radio is reported working on a TVOR.

Maryland Electronics' TVOR is available on 90-day delivery, the College Park, Md., manufacturer says.



Navy Gets New Instrument Trainer

Navy's first twin-pilot-engine instrument flight trainer has been completed by Engineering and Research Corp. The trainer will go into service at Navy's Corpus Christi all-weather flying school.

The trainer does not mimic the flight characteristics of a specific type airplane and for that reason is called a flight trainer rather than a flight simulator. However, the Rockford, Ill., manufacturer has spent no effort to provide realism both in cockpit lighting and in the trainer's "flight" characteristics.

For example, Ercan says the trainer is the first to use cockpit control knobs which are shape-coded and color-coded according to their function. It is the first to use a new radio aids panel later and flight plotting board developed by the Navy's Special Products Center and built by Technical Products Inc., of Hollywood, Calif.

The radio aids unit provides for re-

New Potting Resin Quick to Harden

A low-cost resin, which has good storage properties without refrigeration, has been developed by the National Bureau of Standards for sealing or "potting" electronic assemblies.

Designated the type AN-1 casting resin, NBS says, the resin has good electrical and chemical properties at both high and low temperature. The new resin was developed to replace the previous NBS developed resin which used high-cost L3-dichlorobenzene.

The new resin can be cast (flashed) at room temperature within several days. If the temperature is raised to 38C, the resin will set in about 2 hours and be completely cured in 20 hours, NBS says.

"Operation Push Button"



H-4100

NEW HARTWELL PUSH BUTTON LATCH

- Flash
- Self Closing
- Easy to Operate
- Simple to Install

Latch is operated by a natural rotation of the hand for push-to-latch pressure action. As the finger tip is depressed, the latch handle rotates, providing a sturdy grip when closing. Ease of use for efficiency and economy today finds a powerful ally in the Flash Latch and Flash latches of HARTWELL.

Here is the latest "pull button" method for solving poor latch locking problems.

Write for engineering specifications and catalog.

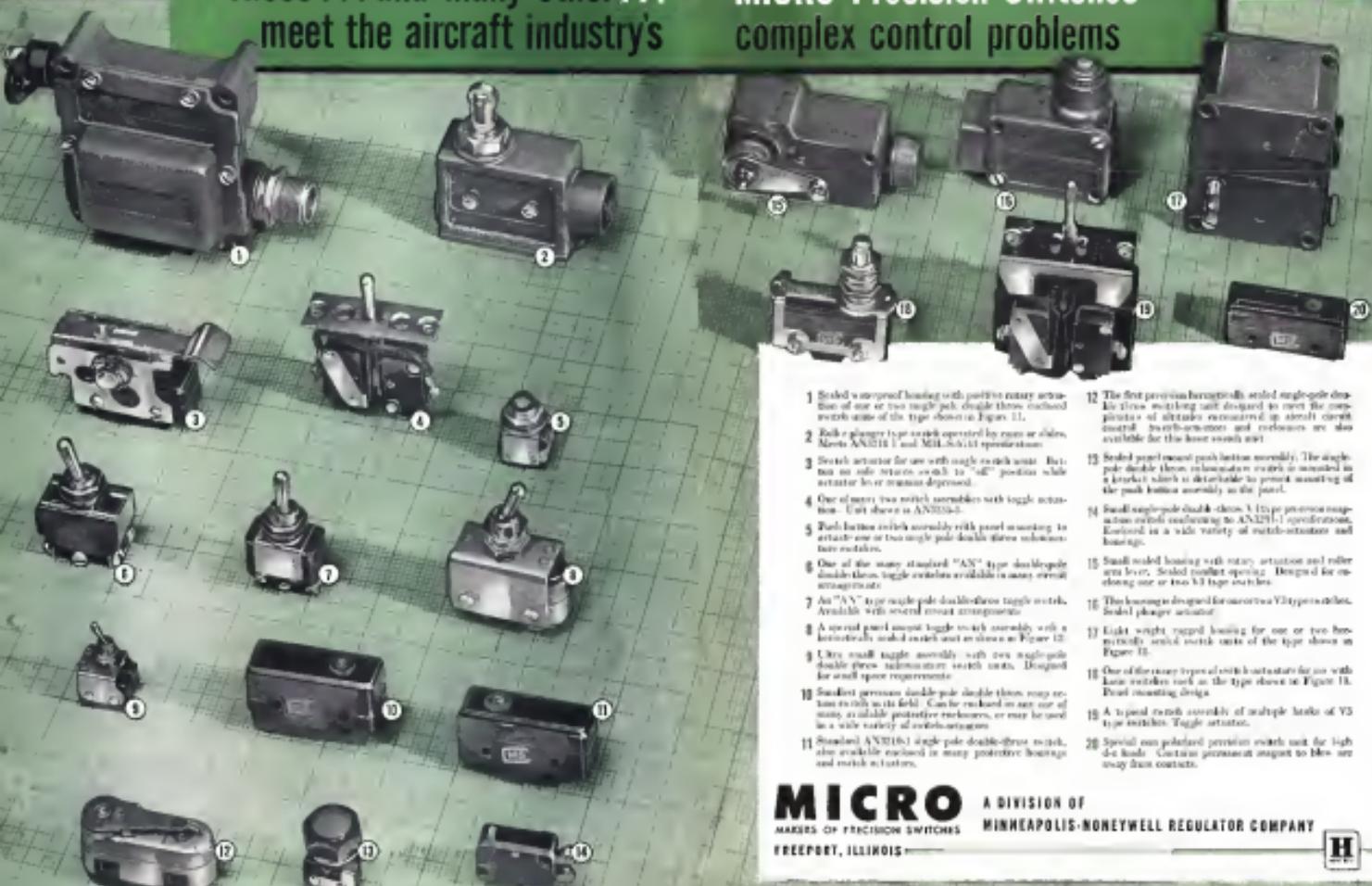
HARTWELL

AVIATION SUPPLY COMPANY

Manufacturers of *ARMED* Flash Latches and Rings, Finger and Cable Terminals, 9518 Wilshire Boulevard, Los Angeles 34, Calif. Branch Office: Wichita, Kansas

These . . . and many other . . .
meet the aircraft industry's

MICRO Precision Switches complex control problems

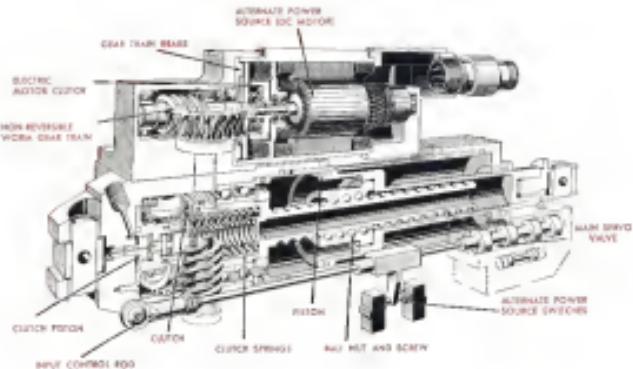


- 1 Sealed waterproof housing with positive rotary actuation of one or two single-pole double-throw switch units of the type shown in Figure 11.
- 2 Rock-a-plunger type switch operated by crew or pilot. Meets AN/SGH-1 and MIL-S-151 specifications.
- 3 Switch assembly for use with single-pole switch units. It is normally open or normally closed in "off" position while actuator lever is rotated depressed.
- 4 One of many two switch assemblies with toggle action. Unit shown is AN/SGH-3.
- 5 Push-button switch assembly with panel mounting. It is actuated one or two single-pole double-throw switch units available.
- 6 One of the many standard "AN" type double-pole double-throw toggle switches available in many overall arrangements.
- 7 An "AN" type single-pole double-throw toggle switch. Available with several switch arrangements.
- 8 A special panel mount switch assembly with a horizontally mounted switch and actuator as shown in Figure 12.
- 9 Ultra small single-pole assembly with two single-pole double-throw miniature switch units. Designed for small space requirements.
- 10 Standard precision double-pole double-throw rotary switch units in the field. One unit can be used in one or more switch enclosures or may be used in a wide variety of switch configurations.
- 11 Standard AN/SGH-1 single-pole double-throw switch, also available enclosed in stamp protective housing and switch actuator.
- 12 The first precision hermetically sealed single-pole double-throw switching unit designed to meet the requirements of switches required in aircraft circuit control. Switches are now available in a wide variety of switch-actuator and enclosures.
- 13 Sealed panel mount push button assembly. The single-pole double-throw illumination switch is mounted in a bracket which is attachable to panel mounting of the push button assembly in the panel.
- 14 Standard single-pole double-throw V-100 precision snap-action switch conforming to AN/SGH-1-1 specifications. Enclosed in a wide variety of switch-actuator and housing.
- 15 Small sealed housing with rotary actuation and roller arm lever. Sealed switch operating. Designed for enclosing one or two V-3 type switches.
- 16 This housing is designed for mounting two V-100 type switches. Sealed plunger actuated.
- 17 Light weight rugged housing for one or two horizontally switch switch units of the type shown in Figure 13.
- 18 One of the many types of switch-actuator for use with basic switches such as the type shown in Figure 13. Push mounting design.
- 19 A typical switch assembly of multiple banks of V-3 type switches. Toggle actuated.
- 20 Special non-polarized precision switch unit for high dot loads. Contact pressure adjusted to 1000-1500 dynes from contacts.

MICRO
MAKERS OF PRECISION SWITCHES
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A DIVISION OF
MINNEAPOLIS-MONEYWELL REGULATOR COMPANY





GET NEW DESIGN FREEDOM WITH AEROPRODUCTS SELF-LOCKING ACTUATORS



Instantaneous and positive in action, the new Aeroprod actuator automatically locks itself in any position. This self-locking feature gives absolute control of any movable part, eliminating design limitations that have heretofore prevented development of many aeronautical advancements.

Aeroprod actuators may be coupled in series or tandem to give identical, simultaneous control of more than one movable part. The basic design is infinitely variable for hydraulics, pneumatics, electric or manual operation, or any combination of these.

Designs are already in use for variable control aircrash and jet engines. Others are in process for guided missiles and various commercial applications.

Actuators now in production are:
 Republic P-47 Hydraulic Tail
 McDonnell F3H Horizontal Stab/Elev
 Others announced

APPLICATIONS

- Gun Turret Control
- Air Brakes
- Vertical Motors
- Dive Brakes
- Variable Wing Incidence
- Airplane Control
- Attitude Control
- Vertical Wing Sweep
- Bomb Bay Door
- Landing Gear
- Turn Control
- Camera and
- Seat Control



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Designing for tomorrow



Aeroprod

ALLISON DIVISION • GENERAL MOTORS CORPORATION • DAYTON, OHIO

FILTER CENTER

► **Colt to Show New Antipillot**—Colt Radio will soon enter a new field with an unusual pilot built around its integrated Filter System (Zarri Radio type flight filter). Design is present in HFS 40 to convert it into an automatic pilot by adding a servo amplifier, servo actuator, etc. Prototype is being installed in company's B-52s, cast for demonstrations to military and airline personnel.

► **Primes to Use Radar-Elon**—search radar for use in aircraft and terrain warning has been ordered for the Saunders-Roe Princess flying boat, according to the British magazine, Flight.

► **Meet Close the Gap**—"We must close the gap between the developer of military electronics and the user," (now) a number of years ago. "We may be an additional technological lead, but we are not advanced," Maj. Gen. George E. Beck, Chief Army Signal Officer commented at the recent National Electronic Conference in Chicago.

► **Manle Gudde-Niles**—Instruments, Inc., manufacturing arm of Niles Laboratories, has delivered its first production version of a "computer for an aircraft fire control system" to Navy BuOrd. Photo of the device in a 4-ft. shipping case indicates it may be ship- or ground-based, possibly for guidance of ground-to-air missiles via BuOrd's Terrier, built by Convair.

► **New Avionics Components**—
• Small track powertrain suitable for servo system stabilization has low starting torque and output voltage up to 12 volt per 100 rpm. Unit is about 28 in. long by 12 in. wide. (Globe Industries, Inc., 125 Searles Place, DuPage 7, Ill.)

• Chatterproof pressure switch, which contains feature only to prevent the plunger contact chatter under vibration as available in Series 451. Unit can handle up to 5 psi, and can be set to operate at any stipulated pressure up to 40 psi. (Circuit Laboratories, 17 Court St., Merrimack, N. H.)

• Encapsulated, wire-wound resistor, said to be capable of withstanding extreme humidity, is available in 1 to 10-watt ranges, 1 to 2 volt ratings, and operation from -65 to 150°C, or up to 190°C if needed. Manufacture says units meet appropriate military specs. (Corrman Mfg. Corp., 2240 Sepulveda Blvd., Los Angeles, 46, Calif.)



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4. Strength Tests, 5. Speed Production
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8. New operation cells for cost, especially shaped metal parts, and the use of cast to overtake the

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Write for New Program Book

PRODUCTION



Progress Made in Heavy Forge-Press Art

Know-how gained with 18,000-ton machine will prove valuable on new Wyman-Gordon units.

By Irving Stone

North Grafton, Mass.—A new era in the metal forging art is beginning to shape up. In this small New England town, the Air Force is steadily readying a key segment of its heavy metal forging program—designed to meet aircraft structural requirements for stronger, steeper, larger, more precise components in the fast-changing aerospace race (AVIATION WEEK July 2, p. 38).

This North Grafton facility, now being operated for USAF by Wyman-Gordon Co., already houses the largest forge press in the country—an 18,000-ton

press, which has been squaring out big parts for military aircraft, which goes on a production line.

Plans for these forgings have already

been made for B-57 and B-47

Republic F-84, Douglas C-124, and

many other Air Force and Navy aircraft. Components have also been

made for Allison, Westinghouse, Pratt & Whitney, Goodyear, and Bell.

Now Prism Soon—New

the plant is being expanded to accomodate two

new forge press giants—a 35,000-ton

and a 50,000-ton unit—and their supporting equipment?

These large machines, first of the

U. S. Refinements

Contrary to popular belief, most major advances of the heavy forging art have come from this country, not Germany.

It is true that heavy hydraulic presses for die forging were first built in Germany. The first press on the German market—16,900-ton tons and a 33,000-ton machine—was started to press of relatively simple configurations.

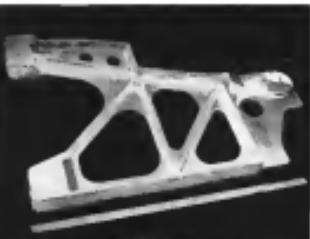
When existence of these machines became known, an experimental plant was set up at North Grafton, Mass., equipped with one 18,000-ton forge press built by Meiss Machine Co., Pittsburgh, Pa. Operation of this facility was begun by Wyman-Gordon Co., Inc., the Air Force, in 1946. Forging results accomplished there, coupled with the demands of the evaluation program, led to the heavy press program calling for 17 large forging units, extending to 177 large forgings of extreme complexity.

Until recently, all the heavy press forgings produced in this country were turned out on Wyman-Gordon's 18,000-ton press. Parts produced have been larger and intricate and go beyond German accomplishments on similar equipment. Experience gained points to even greater achievements on the large units to come under the heavy press program.

B-47 Forgings . . .



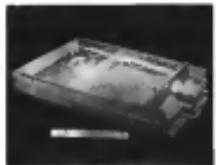
B-47 Segment
35 ft., 490 sq. in.; 145 aluminum alloy.



B-47 Segment
35 ft., 425 sq. in.; 145 aluminum alloy.



B-47 Segment
120 ft., 721 sq. in.; 145 aluminum.

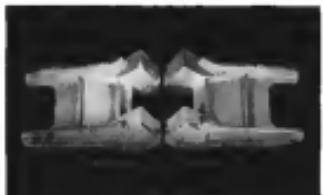


Wing Rib
120 ft., 547 sq. in.; 145 aluminum.

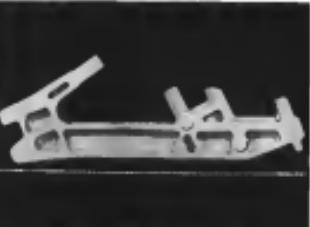


Landing Gear Trunnion
100 ft., 640 sq. in.; 145 aluminum.

Navy Fighter Forgings . . .



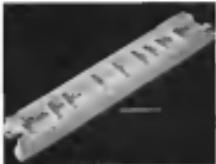
Wing Beam
11 ft., 125 sq. in.; 718 aluminum alloy.



Wing Root Fitting
16 ft., 360 sq. in.; 718 aluminum alloy.



Wing Fitting
13 ft., 151 sq. in.; A230-X aluminum.



Wing Beam
41 ft., 1,690 sq. in.; 718 aluminum.



Wing Box Beam
75 ft., 3,780 sq. in.; 145 aluminum.



in AIR TRANSPORTATION Dependability is a must

...and anything less than the utmost in dependability can result in disaster. The electronic components that carry the pulse of ground-to-air communications and G.C.A. must function perfectly at all times. In addition the connection that carry the power from the aircraft's generators to the electronic instruments and to the motors which operate the control surfaces etc., must be fail-safe.

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or 35,000-lb. cast, which are coming from Italy.

► **Expended Facilities**—In the coding Wyman-Gordon North Grafton setup, in addition to the 18,000-tonne Meissl forge press, which carries the bulk of the work, there is a 3,700-ton rebuilt German Schlossmühle press, ready to go into operation for the forgings in sizes below those normally made on the Meissl. There is also a 1,500-ton Wood press used mostly for preliminary operations such as cross-boring, threading operations in open dies, and drawing. These facilities are housed in \$2,000 sq. ft. of plant space.

In the expanded forge shop there will be an additional 180,000 sq. ft. (including stock storage and carriage), affording a total forge area of 265,000 sq. ft. Power and maintenance quantum for tool and the shop, heat-treat and service will add another 531,500 sq. ft. An office building for housing an engineering staff, laboratory, administration, hospital and cafeteria will cover 51,672 sq. ft. Two new pump rooms will add 27,500 sq. ft., powerhouse another 14,300 sq. ft.

► **Progress**—Graebel-Wyman-Gordon has been engaged on aircraft and engine parts, as well as 30,000-ton presses, since the latter half of 1946. These have not, as a rule, been model of all types, but have involved some unusual configurations, and have been made for aircraft and engines of enormous manufacturers engaged in military work. A wealth of know-how has been accumulated in the heavy forging art.

This does not mean that the new 35,000- and 50,000-ton presses, with almost double and triple the force, respectively, of the 18,000-tonner, will usher in a forging regime that can be expected to produce extremely large or complete integrally rifled wing pieces anything soon. This sort of achievement, despite the talk that has been bandied about, isn't in the cards definitely—and perhaps not even for a very long time. The smaller forgings

U.S.S. Carilloy steel springs soak up 8 million lb.-ft. Torque!

Alley springs cushion tremendous mechanical shocks in 200-ton short-circuit generators ... save expense of forgings

► In testing high-voltage circuit breakers, engineers at General Electric Company intentionally short-circuited low-voltage motor-driven generators. Each of these test generators is naturally rated 125,000 kva, but provides short-circuit currents as high as 182,000 kva, instantaneous peak of the current wave, corresponding to about 1,000,000 kva rms dynamical short-circuit duty. Such operation creates tremendous mechanical stresses to build up inside each machine.



At General Electric Company's new research/development laboratory, the 182,000-kva short-circuit test generator is shown. At the point of attachment of the springs, the axial centerline of the machine stays within 30 mils of its normal position. These measurements are sufficient to cushion the shock effectively.

But no damage is done! These powerful machines are mounted on U.S.S. CARILLOY steel plate guides that absorb the tremendous mechanical stresses to cushion them.

The springs must absorb these terrific shock torsion loads, as often as 49 times an hour, so a long, very durable steel is needed.

Forged springs were considered first. But GE engineers, with the cooperation of U.S.S. CARILLOY, developed a better solution: alloy steel, U.S.S. CARILLOY 4346, provides the required mechanical properties at much lower cost. This steel is tough, even though extremely hard, and it absorbs good radiations at 49,000 psi, as required in this application. In addition, it is easy to heat treat.

The CARILLOY steel is giving excellent service. Under the most severe shock loads, the 182,000-kva short-circuit test generator has not vibrated more than 35 mils away at the point of attachment of the springs. And the axial centerline of the machine stays within 30 mils of its normal position. These measurements are sufficient to cushion the shock effectively.

Any time you need a steel that will provide high strength and toughness, low temperature toughness, high temperature strength, or any combination of these properties, look for a CARILLOY steel. Experienced U.S.S. metallurgists will gladly help you choose the one best suited to your requirements.

U.S.S. Carilloy Steels

UNITED STATES STEEL COMPANY, PITTSBURGH • OHIO COAL COMPANY, PITTSBURGH, OHIO
TENNESSEE COAL & IRON DIVISION, FRUITLAND, PA. • UNITED STATES STEEL, BIRMINGHAM, BIRMINGHAM, ALABAMA • UNITED STATES STEEL, NEW YORK, NEW YORK
UNITED STATES STEEL, CHICAGO, ILLINOIS
UNITED STATES STEEL, SAN FRANCISCO, CALIFORNIA

UNITED STATES STEEL



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B-52 Bomber.
Weight, 155 lbs; 725 aluminum alloy.



Wing Fitting.
Weight, 129 lbs; 715 aluminum alloy.

still pass a lot of position that have
to be tested.

► **Now Problems Ahead.**—However, the
new pieces will be testable along
the experience road, making now op-
portunity for longer single passes, closer
tolerances, thinner walls. Operators
will have to learn a lot about forgings
capabilities and initially these machines
will be experimental pieces in a
further extension of the forging art.

Airframes and engines now, too, will
have to ease into the new forging
designs one. Most design sub-
sisted today for economy by doing
one casting, one forging, with the
one casting, one forging, will have to
be redefined between designer and
operator to establish a common ground
of understanding as to the possibilities
and limitations of the forging process
on the big machines.

The essential framework between
the two probably will begin with the ac-
ception of the design, progress through
the drawing stage, and continue right
down to the forging operation.

► **Greater Interest Seen.**—With the new
machines on the way for the Garretts
and others, the implement de-
signers into the large forge gear has
been translated. Initially, many am-
bitions were hastened to get all their
production eggs into one basket—a
located unit of heavy forge facilities
—because machine breakdown could
mean a serious curtailment of production.
But the approaching availability
of a large number of the heavy power
has worked to damp designer theor-
ies, and again is it that if the big
machines were available today, operators
would have a flood of orders for large
single-piece forgings?

► **Other New Ideas.**—In addition to
the 35,000- and 50,000-ton units for
Wynne-Carter, another one large



UTICA HELPS



BY SUPPLYING Finished TURBINE AND COMPRESSOR BLADES

Utica is proud of its part in the forging of turbine
and compressor blades for jet engines. And now a new
step has been added. An important defense task has
been taken from other hard working shoulders — and
the country's all-important blade production for jet
engines has speeded and increased.

Utica's facilities now include an entirely separate
and extensive plant for the finishing of blades. Great

precision grinders and hammers cut slots into hard-to-
work metal. Automatic polishers bring airfoil character-
istics to perfection. The fleet of metrological equipment
guarantees the finished product.

This is not work that can be done by rote. Many of
these are "finitive" processes. They require the ad-
vanced and specialized knowledge of metallurgy and
metalworking for which Utica stands.



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MAKERS OF THE FAMOUS UTICA LINE OF DROP FORGED FLIES AND ADJUSTABLE WRENCHES

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Engineered
for Production

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plants are going to Aluminaux Co. of America at Cleveland, 25,000; and 25,000-tonnes to Koenig-Aluminaux & Chemical Corp. at Newark, Ohio, and to Harvey Machine Co. of Texaco, Calif.

These eight heavy forgings are not the only big assemblies in the works. Nine big extrusion presses ranging from 8,000 to 30,000 tons will be put into plants operated by Koenig, Harvey, Alcoa, Reynolds Metals Co., and California Wright Corp.

► Materials. Parts-Work at the North Grafton plant is devoted solely to aircraft parts—mainly airframe components and some engine parts. Aluminum alloys forged include 1106, 2083 and 7075. Since 715 has been forged as the part Magnesium alloys used are A269 and ZK 50.

No aluminum alloys have been forged at North Grafton, which can't afford to have forgings retooled to Wisconsin's Wisconsin, Man., plant, on an experimental basis. Large pieces forged of titanium will not be transferred to North Grafton until the Air Force directs the shift.

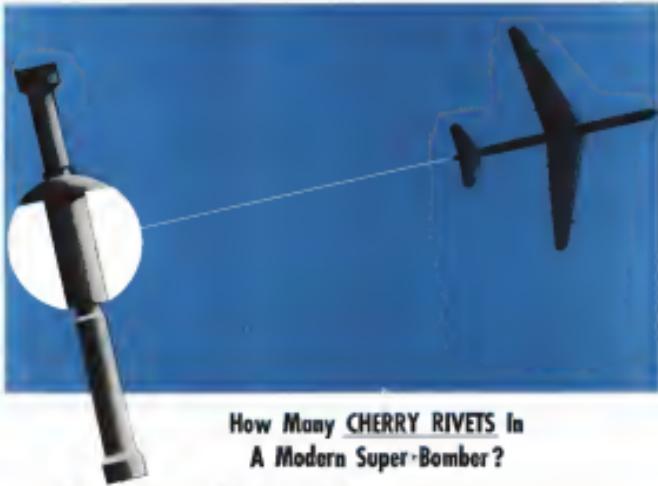
Parts that have been or are now being made in aluminum and magnesium alloys range in weight from about 25 to 500 lb. Surface of about 1,000 sq. in. is the heating area processed on the 15,000-ton press, but this isn't a hard-and-fast figure—it depends on the forging configuration. Components include spar webs, airframe bulkhead segments, control-linkage, empennage fairings, horizontal stabilizers, main and tail rotor, helicopter main grip plates and landing gear cylinder, frames, brackets, and wheels.

► Large Rivets. It is possible to make parts of considerable length on the press. One experimental T section spar for a bomber is 11 ft long and weighs only about 100 lb.

On the new press with 32x32-ft bed, greater possibilities are opened up, even though the bed size isn't a direct indication of the forging size obtainable. And despite the size of the press, the part size and the weight, and—the higher the strength, the greater the pressure required. For forging 715, 35,000-40,000 psi pressure is required.

Moreover, forgings up to 20 ft in length are made at present with the new Air Force presses, and those will, too, are in the picture if the materials will hold up. There is a possibility of going to lengths of 40 ft and on some types of work even to much greater stretches through the use of multiple dies (not through the press necessarily). But that capability is merely conjecture—the answer still lies in the problem-structured future.

In the final analysis the controlling factor for forging length will not be



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the part but the length of the fastener is a supporting piece of equipment.

► **Fastener Two in One**—One big part that the new process could perform would be the production of larger micro-hole fasteners. Limitations of the 30,000 ton and 30-ton model 2 hydraulic presses would not allow many fasteners, and after all this or more components, later cut and at the joining ends and fastened with bolts. In some instances a large number of bolts would be required, adding substantial weight to the completed assembly, extra machining and more costs.

An example of what might be done on one of the new presses, a design for a rib which would now be made in two sections with respective lengths of 43 and 39 in. (107 in. total) projected area of 1,030 and 845 in. (1,075 sq. in. total) and lengths of 133 and 139 in. (272 in. total) might be accomplished by single dogging of dogleg length and width and weighing only about 250 lb.

► **Careful Analysis Needed**—There is a point of diminishing return in the use of fasteners that might be produced, because of the cost and time involved to produce the dies. It is felt in operator circles that the \$5,000- and \$10,000-ton presses will afford a much closer margin to the solution of this problem than has been possible with the 10,000-ton unit. Some people are even taking of pieces in the 20,000-ton class but others feel that a bulk should be taken, because of the costing problems involved.

The thinking is that the \$5,000- and \$10,000-ton presses are limitations for the present—a stopping point to get the cost down to that. Also, to meet metallurgical and mechanical specifications for larger doglegs, properties of billet materials in the larger sizes must be perfected to take full advantage of the larger presses.

► **Fastener Process**—Cyanamid would like to eliminate tooling with the larger presses, in that production costs, the dies, and the fastener cost will not permit that. Also, some fasteners have to go through the press several times to get the required configurations, because some processes available can't do the job with fewer passes. With the greater pressure of the new presses, fewer passes could mean a cut in production expense.

For example, for a simple part, the billet may have to go through the press only once. After that, the part is removed as a tree part (if it is a quantity production part) or a "bandise." Then, the part is cleaned in caustic (padding), inspected and any surface defects ground out.

A more complicated part goes through a series of dies to bring it to the final configuration and the steps



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C-124 Passing Combat Test in Korea

- Giant transport plays a key role in airlift.
- Whole wing now flies the Douglas plane.

By R. F. (Pepper) Martin
(McGraw-Hill, Wash. Met.)

Tokyo-to a modest evolution is combat cargo or transport, the giant C-124 Globemaster, a composite new-comer, is beginning to replace C-54 in the Korea airfield.

The Globemaster, now about two years on the Tokyo-to production line, has been used in the United States by the Strategic Air Command's Strategic Support Unit operations. It was given a thorough test in Alaska. But the first real test in combat strength and under actual war conditions came in Korea, where a whole wing has been converted to the huge plane.

Preliminary evaluation discloses that the Globemaster is suitable for use in normal combat conditions. It is, however, too ready to overload since the plane stands up in sustained operations under gauching conditions.

► **Payload Limit.** Because of a shortage of gardens in Korea, the Globemaster must carry enough fuel for a round-trip flight without stops. The required range is not quite above 10,000 ft.

The Globemaster can get in and take off from short, rough fields—it can use a 3,000 ft. strip—but there is no cargo utilization under these conditions. It is an exceptionally sturdy plane. One loaded short and let a four-foot hook, breaking out its left landing gear. But the plane rolled 5,000 feet before the gear finally collapsed. That was the only major operational accident thus far.

The C-124 has, as can be expected, the C-54, C-47, C-97, C-119, etc., that are the workhorses of the airfield. The size of the plane is the major factor for short airfield use. The C-124, however, is a key part of the team that has carried more than 1.7 million passengers, more than 240,000 air crewmen and approximately 300,000 tons of cargo to and from Korea.

► **C-124 vs. C-54.** Many size may be misleading in terms of operational efficiency, but here is a comparison of the C-124 and the C-54. The C-124 carries four times as much cargo and four times as many passengers as the



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can be moved fast in the large Douglas C-124 transport. About 700 needed loaded area and their luggage can be carried in a flight.



MAINTENANCE

and repair of combat-damaged equipment is hastened. This F-55 is being loaded for flight to Taegu to be rebuilt.



MEDICAL

can be given a medical with using many lives in the Korea war.



MATERIEL

in large quantities has been carried by C-124s to the Korea airfield. Largest single item was this 10,000 lb. gun carriage used for hauling artillery.

C-54. It is the only cargo plane that can carry as M-24 light tank.

It has a gross weight of 175,000 lb. and at 10,000 ft. is 5,500 lbs. (gross) engines, compared to the 73,000 lb. and 1,450 hp engines of the C-54. It compares between 2,400 and 3,000 lb. of fuel in the same amount of 175 lb. of fuel in the Korea area. The C-54 uses 1,200 lb. of gasoline an hour. The C-124 at 127 ft. is as long, has a wingspan of 175 ft. 4 in. and the tail stands 60 ft. 4 in. high. The C-54 is 91 ft. 11 in. long, spans 117 ft. 5 in. and stands 37 ft. 5 in. high.

► **Troop Transport.** The Globemaster's maximum capacity (25 tons of cargo, or 200 combat troops, or any combination of the two) makes it ideal for cargo or troop transport on all but shuttle runs. Actually it has not yet been used to its full capacity. In the past, the 175th Air Division (Globemaster) moved equipment from Japan to Korea and back so heavy it took 10 hours or more.

But the early start left by the C-124 may be its best a practice movement of 1,500 men. Four Globemasters were used in the 10th, each averaging about 150 combat loaded men, each man with a broad-shouldered harness bag, fifty rucksacks, 30 canteens and large quantities of supplies and packages were filled at the same time.

Twenty-five of the C-124s could move 5,000 equipped combat troops one way with no wasted time or delay by shuttling the planes back and forth. Maximum numbers of troops could be moved quickly anywhere in the Far East.

► **Evacuation of Wounded.** While part of the Globemaster's main capacity, Air Force units are also quick to move out the plane has been used in one of its evasions of wounded. It took only 20 minutes from the time the wheels touched ground until the last of nearly 100 wounded were aboard an ambulance at a C-57 that carried them to a nearby hospital. Little time was saved since patients could be loaded while others were released at the objective.

The history of the C-124 in Korea is a remarkable study of frustrations, perseverance and finally comparative success. Early in 1951, the Gen. John F. Harter, CG of the 175th Air Division, reported that they be based on the Korea airfield. The first plane from the Air Transport Guard arrived in September. The crews had orders to wait it under all conditions and with every type of cargo, passenger and even eva-

tion. The test was successful. A world's record load of 167 air crews, 102 of them litter patients was set. Two 25-ton loads of hand grenades and explosives were fired from Japan to Korea. There was "no sweat" in either evacuation load. The heaviest single

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size carried was a 35,000 lb. prime mover tank. Rudder wire, a 33,000 lb. Air Force jet truck, the fuselage of a crashed F-86, H-19 helicopters fuselage and, extraordinarily heavy stone that could not be carried in a C-124 were included.

► **Airlift Assignments.** The Air Force is engaged in an accumulation that C-124s will be assigned to the outfit. This spring a Matsukai Transport Unit from Chitose, Ibaraki, arrived in Japan. Selected flying crews personnel were flown in from the 374th Troop Carrier Wing, Germany, and another group from there to the outfit. In addition to normal refueling and checking, pilot task 40 hours in the Lieutenant's school. They also flew C-54 aircraft to Korea to maintain their flying proficiency while maintaining the Globemaster.

The transports were primarily in maintenance. Boxes of spare parts and other equipment, which for some reason had not been given priority, were off-loaded in Tokyo field to make room for higher priority cargo. The C-124 arrived in Japan, some of these fitting were not left.

The Pacific pipeline and whenever on both sides of the areas are not yet filled with control parts, then complicating the already difficult problem of maintenance. The C-124s are experiencing a fair greater proportion of the time than the C-54s, because because of the shortage of parts and inexperience of the ground crews. On occasions, only four of the planes have been operational. Experienced officers suggest that a repair must be established in blueprint the building of parts that a unit will need to repair a plane.

► **Problems for Engineers.** Parking space had to be re-arranged to accommodate the large planes. There are no hangars in the former large enough to accommodate them, so no docks had to be built for maintenance, all of which is done outdoors. The aero-ports could only simply scratch on the face. Pratt & Whitney, R-4160 2000 engines. Most parts and all cables are plain, labeled to there is little chance of confusion or

mix-ups. But ground personnel have not yet learned of the short cuts that speed up maintenance.

Fifth Air Force was somewhat surprised at the thought of what the big planes might do to runways on the final fields. Actually, if since as is let out of the firm, the Globemaster has a lighter impact pressure per square inch than a C-54. It is doubtful that the planes are harder on runways than heavily loaded B-52s and F-86s.

The first wave of July, Gen. Chester E. Nimitz, 512th Division commandant, took in Kamchatka for a load mission flown by a C-124 at Constanza Army base. He circled five C-54 jet transports on the outgoing trip and brought 117 passengers back to Japan. Since then, the C-124s have made regular flights to air bases in Korea and have landed wings to five Japan, Korea, Okinawa, the Philippines and Indo-China. ► **Easy to Fly.** A majority of the pilots now prefer the C-124s to the C-54s. The site is an easy place to fly. In the air, there is a tendency to sacrifice altitude, but the C-124s are able to do this without penalty have not yet become accustomed to it. Pilots are fed no discipline, but the pilots often experiencing "wind resistance" on the flight deck.

The pilots at 20 feet above the ground. In racing, they quickly discovered that water resistance depth set capture was needed, especially on night landings. They also had more difficulty adapting themselves to the wind for calculating ground roll in hot weather.

The more experienced pilots use the instruments to serve something to be desired. The pilots of the flight of instruments found "you can get set seats for speed," they say, but all of the pilots like the simplicity of the instrument panel. All engineering instruments are on the engineer's panel, so the pilot is concerned only with power and instruments from water tanks.

Despite its bulk, the C-124 has considerable maneuverability. Pilots on the top side of the aircraft go up 24

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glasses with full flap. This stops ascent further at low speeds, and gives the pilot much better control.

► **Airline Engineers:** -Note: Please the Globemaster's autopilot and the radio system. The Spruce aircraft pilot holds the plane within 3 degrees and a maximum rate of fall of 16 feet. This flying is more comfortable for an aviator. The Globemaster has emergency equipment with 270 channels and UHF with 38 channels, plus one ground channel, plus an engine control system with UHF 4 channel control in lost.

The engineer's panel is about the same in a B-16. A prospective C-124 panel engineer can run the engine in these seats and will have experience in the B-29, B-58 or B-56. A non-panel engineer goes to ground school for about 100 hours instruction at the panel, but a qualified panel engineer is ready after about 40 hours.

Unlike the C-54, the Globemaster has selective instrumentation. It's C-24 has the two 1000-hp engines, the four 1000-hp engines. The technical rating is 1000-hp in the C-124. He has the pilot's seat in the instrument panel.

Fuel gauges and oil pressure meter, fuel gauges in supply calculation of balance and total weight, study use of aircraft experience in the C-124. The engine planes carried 66,000 lbs of fuel in tanks, but there coming out of the factory have carry an additional 1,000 lbs and have 12 fuel tanks. Panel engineers seem to prefer the older planes because the control and selection have only on controls. There are 24 switches on the new electric fuel selector.

The navigator's job is simplified by automatic computation of time and speed. But he must go to the lower deck to read the data source.

► **Aviation Safety:** The C-124 complies in flight safety. In the cockpit, front landing gear or any fair-wall door opens a warning light fixture. The pilot is warned if the autopilot goes off by cause of electrical failure. Lights in the fuselage illuminate wings and engines for flight examination. Lights in the landing gear provide illumination for ground inspection.

All sections of the plane are readily accessible during flight. The prop or elevator, rudder and the horizontal stabilizer are in a compartment below the flight deck, which also contains the radio equipment that is not on the flight deck. Automatic pilot gives in the rudder and other compartments which are accessible.

A compartment provides access to the wing compartment, generator and power plant. In flight repairs cannot be made on the prop or landing edge of the nacelle, but the ordnance, fuel

props, gear box and electrical system in each engine are accessible.

During the training sessions, an in-flight emergency is simulated and all pilots and crewmen go into the song separately to track down the trouble. In a recent flight from Kansas with 138 passengers, the left outboard engine caught fire. The automatic fire extinguisher did not function properly, and a nervous, Sergeant Curtis Flagg, crushed the song and put out the blaze.

The plane has a 60,000 ft. ceiling in normal flight, though the passenger seating. This allows for the interior 45 ft. tall, to prevent sitting on the ceiling and to move the passenger compartment. A 260,000 ft. floor below keeps the flight deck comfortable. In the Alabam room, carburetor heat was sufficient to prevent icing even at outside temperatures of -40°F.

► **Load Handling:** A fully loaded C-124 (empty weight is 95,000 lbs) and maximum allowable weight is 216,000 lbs) an average example of the "push-pull" type is the Globemaster. The load is distributed evenly over the flight deck when doors are open. The double-truck-type truck (12 ft long when folded) drops straight and then turns out the wheel-mounted leveling section. Fully extended, the truck measures 27 feet. The truck can be adjusted to any use within the plane will carry. At night, lamps inside the nose highlight the ramp and on landing gear.

Load and unloading is almost entirely hand work. A switch block is used to place bags or packages where it can be placed on one of the two levels. One level is 10 ft above the floor. All bags must carry 4,000 lbs. in lifting straight up. With the aid of scissor blocks, they can lift 16,000 lbs. The heavy cargo is winched in from outside, while the low truck winds themselves in. The load operates from four positions, so that cargo can be stacked straight up without putting stress on the floor or the ceiling.

The overhead inside the plane can support a maximum of 50 pounds per square inch. The maximum weight will support 16 pounds, while the "red" load line will support only 15 lbs. The damage area must be shared over support bearing cargo.

The electrically operated elevator will lift 9,500 lbs and will support 9,600 lbs in flight.

Safers is replenished in landing gear. The hydraulic pump that can be used to operate the nose doors and rear fairings and rudder are all closed has three controls—two for the flight deck for the pilot and co-pilot, and one at the nose door.

The lock is the channel door is a mechanical steel finger that reaches



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over and drops on the other door before pulling back into a locked position. A pin set in each of the doors will hold them in place if the door handle breaks or the door is jolted. The door can be dropped in flight, or closed and the latch used to tighten, close.

The hatch also has automatic shut-off to keep them from colliding during movement of cargo. A guard prevents them from being driven of the rail through excessive operation.

The C-124 is a four- or three-star according to need. The forward deck, about 50 ft. deep, is for small cargo. The main deck will hold a single row of 40 passengers. It can be divided into an upper and lower compartment by lowering a steel partition made of headphones on both decks at 6 ft. 2 in. Two sets of seats with a stretcher are hung on removable posts in the center of the plane. Latches or seats are also fitted on each side of the plane on both decks. Safety gates hang from each end of the upper compartment. Fully loaded, the C-124 can carry 127 litter cases and eight attendants, or 300 combat troops with personal equipment.

* * * These figures, though, are not evidence that the C-124 takes no time to load and unload, but only of the extreme maneuverability. The length of time spent on each of the various operations is not known. A full load of combat troops can be set off the plane in four minutes. Sixty-five passengers and 102 litter cases were unloaded in 33 minutes. The heaviest cargo can be loaded and unloaded from the Globemaster in about 35 hours.

Expectations are being made with great per-feeding to reduce the between-flight time. *Fig. Diagram of cargo space layout on the C-124.* The 100-ton weight division is planned, however. But this uses an over-sized ramp space, and there is a scarcity of this at Far East Air Force bases. Sample cables and fasteners which can be attached as pleased in a few minutes are standard equipment.

A major consideration is the need for extreme care in cargo handling while speeding up the turn-around time. Each C-124 is valued at about \$1 million. All personnel has to be carefully and properly trained. Fresh hand laborers are used. Track-driven and jib-like overhead mobile truck training planes took the Los Angeles course, including drivers, drivers to new model aircraft and maintenance at fields where trained personnel might not be available to do the job.

The C-124 provides comfort and safety for both passengers and crewmen. The two pilot seats slide side

ways as well as forward and back, providing room for movement and a comfortable fit for any size pilot. The seats are also seat slippers, so that a pilot can relax on long trips. There are three passenger berths and a large bag set to provide hot meals for the crew.

All crewmen, except the small cargo lathe, are stowable in flight. Two bunks covering the flight deck and other compartments. There is also a telescope bivouac pole as an emergency escape hatch from the flight deck to the wing.

Eight latrines are provided for male passengers, and another for the flight crew or female passengers. A portable toilet can be set up to provide latrines. Portable oxygen bottles are aboard, and there is a balloon oxygen system and outlets for all passengers. A small speaker system provides instant two-way communication from the plane captain to crew and all passengers alike.

Concerns are about passenger comfort in flight also winter. The nose door is not sealed, and those sitting at the forward part of the ship may find it uncomfortable cold. Oxygen tanks are being made with a right valve that will seal off the passenger compartment from the nose, but it has not yet been approved.

* * * Good Use.—"We are making effective use of the C-124," said McCutcheon told *AVIATION WEEK*. "They are now an daily use, mainly on our high-density route between Seoul and the Tokyo area. Most of the flights are made in about 35 hours, plus and return several to the strength of leadership."

Passengers need not pay extra for the use of the SN equipment, according to James on the day. "R & R" (rest and relaxation) leave, "tempo" the term. They feel if # was being chastised on the ground in a Cessna or Lopetole. They like the among nature of the plane, were it gives them a lot of space to visit in and look out the windows. The C-124 is designated compared to the C-124. The men who like the flight compartment, which they are parallel to each other, McCutcheon added.

He said the C-124 has proved "very adaptable" in handling unusual types of loads and heavy cargo. Some 100 tons of equipment in Korea takes a month or more, counting waiting time at the docks, the quick load is extremely important.

"One recent instance," said Gen. McCutcheon, "was when an F-4E was moved from the States. Two big 45-ton lifting cables were needed at two places. They were secured in a hurry and could never have arrived in time for us. We put them both on the same plane and had them there in 45 hours."

—By James E. Dickey, Jr., Staff Writer

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NEW AVIATION PRODUCTS



Tower System Speeds Aussie Airport Traffic

(McGraw-Hill World News)

Melbourne—An automatic indicating system which enables tower operators at a plane to select the safest runway for aircraft to land and take off on has been developed in Australia.

It is being evaluated operationally at Essendon Airport, Melbourne. The equipment has enabled the airport to handle higher density traffic.

Approximately simple, consisting of a telescope-like device on a post which moves a thin beam of light to indicate wind direction and wind strength. This is locked up on safety indicators with a dozen monoculars. Head wind and cross wind components on the duty runway are indicated by scales and runway markings on the diagram. The line of light varies in length, depending on wind strength.

The chart, or runway selection console, is drawn up on polar coordinates with straight lines emanating from a center point radiating from below the telescope's eye.

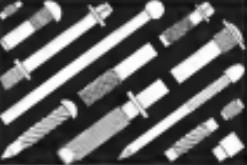
Radial indicators (made of successive diameter emanating from the center point and intersecting the angular scale) indicate the speed of the wind. Each radial is numbered to indicate wind speed value and the further the line of light reaches out from the center, the higher the speed.

Colored lines on the chart represent runways and the wind conditions under which takeoff and landing are to be conducted. Red colored areas signify operations are not permitted.

The equipment was conceived by U. S. Timmerman, senior aeronautical engineer in Australia's Dept. of Civil



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Sier-Bath Precision Gears are used in many of today's aircraft. For example, Sier-Bath supplies gear assemblies for the Westinghouse J34 Jet Engine, which powers the Douglas "Skyraider" and the Chance-Vought "Corsair".



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insuring proper reversal, the Hamilton Standard engines use a mechanical control (locking pin) or cable (shutter) which operates the controls so that each of the controls through the wings with steering positions in pitch, roll, yaw, and roll control, etc. Added to this would be additional weight and the problem of providing an arrangement to support the mechanical control at the gearbox. Baker and Lashbrook pointed out.

► **DC-7 Governor.** The first of the governors with the two new features already has been ground tested in two engines, the Wright R3359 compound engine which will go on the DC-7 and the Pratt & Whitney R3350 used on the DC-6.

However, it is only a prototype installation and some changes are being made. The service test prototype of the DC-6 prototype governor is being manufactured.

Demonstrations recently were held by Hamilton Standard at its test cells at East Hartford for CAA, CAR and airline executives in which the DC-7 governor showed how it could perform as two new functions. The governor also has been run on the Wright engine at the Wright Armament Corp. plant which is located at Wood Ridge, N. J.

The DC-7 governor was in design stage at the time the ALPA proposal came through last spring for a rudder servo mechanism. It was selected as the fastest way of getting the new feature into line.

The main difference between the DC-7 and DC-6 governors is in the fact that the DC-7 requires much a larger pump to operate the larger propeller. Hamilton Standard is satisfied that the demonstration with the DC-7 governor is sufficient test to warrant going ahead with the service-test quantity of DC-6 governors.

Since the idea came from American Airlines pilot, Hamilton Standard expects that the first tests will be made on the DC-6 and a DC-7. However, all the surfaces are not the same. The equipment has been modified so that the new type governors are being made available in service test quantity.

Hamilton Standard points out that the original pilot proposal was made to them shortly after the National Airlines crash and not before, as has been reported in a "True Magazine" article.

The Hamilton Standard engineers point out that the new safety device is subject to the limitations of all hydraulic devices but it is believed that they can make it.

Other features used in the new safety valve system are components which already have had long reliable

service experience and have been proved for varying temperature and vibration conditions.

None of the cases of inadvertent accidents reported they point out, has shown as evidence of malfunctioning in the hydraulic system. The new safety device is relying on power by means of compressed air as a protection against malfunctioning in the airplane control system.

While some other means for preventing inadvertent accidents are still under consideration, Hamilton Standard does not plan to make the new safety valve a mandatory addition on the new governors, but makes a provision for its inclusion at the airline's option. The other new device to allow feathering from reverse pitch will be made a standard feature of the new governors.

Airlines pilots have expressed some concern because with new features are not held as mandatory on the new governors.

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USCG Sets Up Civil Air Unit in Hawaii

An all-weather air station in the Hawaiian Islands has been organized by Commandant Robert Long, USCG. The unit is made up of many small boats and planes spread out all over the Territory. Purpose is to get to a crash as soon as possible. Because of the geographical layout of the Islands, the Coast Guard's planes or boats might take a while to reach an accident in some remote corner of the Territory.

When they go out on an emergency, members of the audience have all the privileges and authority of the Court Martial. Any aircraft accident takes care of all forms of expense incurred in my name and stands behind any liability claim which might arise.

New Route to Brazil

(Milwaukee World News)

Rio de Janeiro—Peruana is establishing an air service between Venezuela, Costa Rica, and Brazil, which will provide a direct link between South America and the Far East, has been granted to the Canadian Pacific Airlines. The new route, expected to be in operation before the end of 1955, will run from Venezuela to Rio via Mexico City, Lima and São Paulo connecting up with CPAY flight routes to Asia at Venezuela.



NEW AUSTRALIAN TERMINAL PLANNED

Here's a photo-diagram showing Long 1 of the proposed runway of newways of Kingsford Smith (Mascot) Airport, Sydney, Australia. The first stage of the long operation, will see an 8,000-ft. runway and taxi strip ready for traffic in March 1955. The full fi-

SHORTLINES

► Anacortes Railroad Co. has cited a CAB certificate for charter service, Baltimore, Washington, Jacksonville, Philadelphia, and New York. All-American Airways, local service airline serving these cities, steady, may claim first rights to such a service.

► Brazil: Always dramatic mail rates have been set by CAB at a "temporary" \$3 cents a ton-mile effective to Oct. 1 of last year, pending formal decisions in the personnel rate category. CAB has appealed to the Post Office Dept. that its CAB will have Brazil to count its "earmarks" reparation reserve.

Company started Ciaerai 540 service Nov. 1—but as far removed 7 of the 30 ordered.

► California Coastal Airlines plans to install a new radio marker beacon in caves with "superior performance" and "half the cost" of present types. It's made by Flite-Tronics, Inc., of Burlingame.

► Civil Aerromarines Board is studying strands of potentiality at the Restaurants owned by Northwest and Pan American. Over 100 passengers are contemplated. CAB has warned all airlines it will investigate advertising directorships of companies applying for range. Current charges of Eastern

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EDITORIAL

The Complexity Problem III

By Wing Commander A. U. Hooke, DFC
(The Second of Two Installments)

► **Steering and Brakes**—Two good examples of sound design are provided by nosewheel steering and anti-skid brakes. Nosewheel steering need only one five to ten g forces of fuel normally required for landing as well as to offset all the additional weight of the steering equipment. The ease and speed of putting into position seem to make it well worth while, and further in the event of brake failure, the pilot can still maneuver to avoid being obstacles. Nosewheel brakes add little to the weight, but they cut down markedly on the longitudinal and rotational wear of tires. Anti-skid length and type of system are closely behind the advances in jet aircraft. Anti-skid is closely behind the fighter's cockpit. Nasal skid blocks will add to the fighter's cockpit safety.

► **Air for the Pilot/Engineer**—The advent of Army transport leads us to the consideration of another aspect of aircraft design, namely, the use of sheer and more conventional

Wing Commander Hooke is Chief Project Engineer at the Central Experimental & Proving Establishment of the Royal Canadian Air Force, near Ottawa. His previous work, presented in these two installments, was done on experimental aircraft in 1949 in the RCAF and RCAF as combat pilot, squadron leader, and project engineer.



propulsive engine aircraft for strafing and fighter-bombing. Here we allowed our engineers for our new crop, the jet, to lead us to the advantages of aircraft such as the Spitfire or Mustang for this type of work?

It is total, in a jet war against a well-equipped enemy, to try to strike at a height of more than 50 ft. and it is quite impossible to do a good job of spotting a target, changing course on it, and hitting it at speeds over 500 mph.

The speed of the jet will be available for strafing, and its maneuverability and low consumption make it most economical. Though operation of this kind is unquestionably more dangerous for an ground fire is concerned) when carried out at low speeds, let us not forget the number of extra passes or dives which have to be made at higher speeds in order to knock out an equal number of well-defended targets.

► **Structural Strength**—At the risk of being called a heretic, I would suggest that our structural strength requirements be examined and possibly relaxed. We are now designing fighters with a load factor of more than seven and an ultimate of 11G. The advent of the jet-C not but has had a tendency to push figures up and up, because a pilot can now stand more. But the added weight penalty has made it difficult for the present day fighter to get above 40,000 lb—and it takes a lot longer. At such altitudes it is impossible to pull more than 3G without pulling out of the sky. This being so, why on earth do we not design to a normal load factor of 4 or 5 and an ultimate of 6 or 7G?

► **Pressurized Cockpits**—During the second World War, air

craft cockpits were pressurized to allow pilots to reach the altitude extremes. In short, does the crew's maneuvering strength have no gain or benefit from them? The weight penalty for structure and heater is high and the advantage is not certain. It is also difficult, because of the lack of time to generate sufficient pressure at high altitude.

An expenditure of a few million dollars at the most should be sufficient to develop a suit for the pilot which would be a combination of a decompressed pressure-suit and anti-G suit. The pilot would still be pressurized for high altitude but not have protection from the cold for his full.

Without pressure suits, a bullet hole or the failure of a canopy still leaves the pressurized cockpit for the pilot of a high-speed aircraft to 40,000 ft., because the cockpit pressure holds him below ambient pressure for the altitude of 40,000 ft. and above.

► **Other Considerations**—In concluding my complaints, let me reiterate my conviction that in attempting to solve one problem we too often become engrossed over pressurized stop-gap that will persist as in the event of war.

It would need to say that we have a conflict with the great rate of roll-wise 270 deg. per second, with our west objective 540 deg. per second. The requirement for a high rate of roll is a legacy of an unreliable configuration, and it plays little part in any type of aerial combat. Aircraft now in production actually have too high rate of roll for even the best of pilots to maintain sufficient orientation.

And here we, by putting a crash helmet on the pilot, really solved the problem of preventing him from rolling him head—Or have we at the same time provided him with blankets such as were formerly used to prevent burns from leaking hydraulic? In the next war it will be just as necessary for a pilot to live beyond his tail as it was in the last.

Again, during the last war the engineers decided to put weights in the Spitfire control system because were good tried to show how strong he was, until back on the stick, and then the wings off. The extra weight lowered the pilot and seriously slowed down maneuvers in the looping plane, and although there was an order against it, the weights were tossed away. How long can a country go on winning wars in spite of all this sort of thinking?

► **The Ideal Fighter**—The ideal fighter would have enhanced altitude, speed, rate of climb, range, maneuver, comfort, strength, safety, and maneuverability and landing rate, fuel consumption, rate, weight, and cost. Unfortunately, the requirements conflict with each other, and it is much easier to criticize than to arrive at a solution.

We won't, however, get even closer to it if we blind ourselves to the fact that compromises have to be made. Provided who are in the service today may not feel the user are, but it is their duty to pass on the best possible tool and knowledge to the men who will fight it for them.

Every department concerned with the design of an aircraft wants perfection for his particular job. Therefore no one must be appointed in charge. Without such an empire we shall have complicated and weighty fighters. Too many safety features can become derogatory. Every safeguard component of a fighter must be examined superficially, and rejected unless absolutely essential. It should be easy to reduce the weight of a fighter, while maintaining the same load and orientation, from 10,000 lb. to 12,000 lb. The rate of climb will be increased approximately 15%, the 2,000 lb. weight will be reduced by 4,000 lb. Performance, while the wing loading will remain the same, every other aspect of performance will be improved.

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